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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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78-2501. Lee, R. E. (Health Eff. Res. Lab., EPA, Research Triangle Park, NC) **Introduction (Chapter 1).** In: *Air Pollution From Pesticides and Agricultural Processes.* Lee, R. E., ed. (Cleaveland: CRC Press): pp. 1-4; 1976. (9 references)

In a general introduction to the subject of air pollution resulting from agriculture and the use of pesticides, it is emphasized that pesticides have decreased agricultural losses and that farm mechanization has increased crop yields considerably. Pesticide production has doubled since 1960 and tripled since 1950; about 65% of pesticides used in agriculture and forestry are applied by aerial spraying. Pesticides are the only toxicants introduced into the air intentionally by man; other air pollutants are waste products from combustion engines, power plants, incinerators, or other industrial processes. The danger of airborne pesticides is that they are usually stable compounds which persist for a long time in toxic form, they are absorbed directly into the blood, they can be carried for long distances by air currents, and they can remain suspended in the air for long periods of time. The current knowledge about airborne pesticides, the methods of measurement and collection, human toxicity and legislative controls are dealt with in this monograph. Individual papers are abstracted in appropriate sections of this issue of *Pesticides Abstracts.*

78-2502. Lewis, R. G.; Lee, R. E. (Author address not given.) **Air pollution from pesticides: sources, occurrence, and dispersion (Chapter 2).** In: *Air Pollution from Pesticides and Agricultural Processes.* Lee, R. E., Jr., ed. (Cleveland: CRC Press): pp. 5-50; 1976. (191 references)

In a review of the sources of atmospheric input, the occurrence in air, and the transport and removal mechanisms of air pollution from pesticides, recent data is presented. Spray application is the major source of atmospheric pollution by pesticides, but other sources include volatilization from crops and soils, windblown dust, evaporation from water, the manufacture of pesticides, and disposal of pesticides. Background levels of pesticides in the air are given for different areas of the world. Urban levels of pesticides in the air are generally higher than those measured at background stations, but the pesticide residues are only a small fraction of the total urban air pollution. Rural and agricultural levels, as well as indoor levels of pesticides are given. Trandport and removal mechanisms of airborne pesticides are also discussed.

78-2503. Keith, L. H., editor (Environ. Res. Lab., EPA, Athens, GA) **Identification and analysis of organic pollutants in water.** (Ann Arbor Science Publishers, Ann Arbor, MI): 718 p.; 1977. (700 references)

Recent advances in methodology and instrumentation, especially computer-assisted gas chromatography mass spectrometry, now make it possible to identify and quantify specific organic pollutants in water. This in turn makes it possible to evaluate the distribution of these compounds and single out specific substances for health effects research. About 400-500 compounds have now been identified in drinking waters throughout the world, and *ca.* 1500 in all types of water. The chronic effects of most of these chemicals are unknown at the trace concentrations at which they usually occur in drinking water. Methods currently in use or under development for separating and concentrating complex organic pollutant mixtures for GLC analysis include gas purging, headspace analysis, resin adsorption, carbon adsorptin, liquid-liquid extraction, and semipermeable membranes. High-pressure liquid chromatography is presently the leading technique for separating nonvolatile compounds. Analyses of specific water types are presented. (Material mostly obtained from symposium program on *Identification and Analysis of Organic Pollutants in Water* at the First Chemical Congress of the North American Continent, Mexico City, Mexico, December, 1975. Individual papers are abstracted in appropriate sections of this issue of *Pesticides Abstracts.*

78-2504. Vanhuss, R. E., Jr. (VA. Dep. Agric. & Commerce, Richmond, VA) **Kepone - a crisis situation.** *Assoc. Food Drug Off. US Q. Bull.* 42(1): 55-56; 1978.

Hazards from Kepone (chlordecone) initially arose when workers at the Life Science Products Plant in Hopewell, Virginia became ill with symptoms of pesticide poisoning. Kepone had found its way into the ecosystem through effluent seepage and air convection. Virginia sewage treatment plants, lagoons, soil around in the plant, and sediment in the James River all contained Kepone. Methods employed in dealing with this crisis situation are reviewed.

78-2505. Hoffman, O. L. (Gulf Oil Chem. Co., Merriam, KS) **Herbicide antidotes: from concept to practice.** In: *Chemistry and Action of Herbicide Antidotes.* Pallos, F. M., Casida, J. E., eds. (New York: Academic Press): pp. 1-13; 1978. (21 references)

Herbicide antidotes make it possible to chemically control unwanted plant growth while permitting the growth of an economic crop of the same genus, species and variety. Initial observations which led to the commercial products were 2,4,6-trichlorophenoxyacetic acid (2,4,6-T) antagonism of 2,4-D on tomato and the total inactivation of barban by 2,4-D. The development of a fast, cheap and accurate detection method for herbicide antidotes led to the development of 1,8-naphthalic anhydride as an antidote for thiocarbamate, chloracetanilide, and dithiocarbamate herbicides on corn. In addition, 1,8-naphthalic anhydride also has utility for antidoting alachlor on sorghum and rice, molinate on rice and barban on tame oats. In addition to naphthalic anhydride some halogenated alkanoic acid amide-type chemicals have shown antidoting properties against several herbicides. [Symposium at the 173rd National meeting of the American Chemical Society, New Orleans, LA, Mar. 24, 1977].

78-2506. Casida, J. E. (Unov. California, Berkeley, CA) **Herbicide antidotes: progress and prospects.** In: *Chemistry and Action of Herbicide Antidotes.* Pallos, F. M., Casida, J. E., eds. (New York: Academic Press): pp. 161-164; 1978. (5 references)

The concept of herbicide antidotes was introduced by Hoffmann in 1962 and during the 10 years following that date, the concept became an accepted agricultural practice. Treatment with antidotes has limited corn injury from thiocarbamates. Optimization of antidotes for other crop herbicide combinations has been more difficult than was the case with corn. Present antidotes appear to act by increasing herbicide detoxification, but there are also mechanisms suggested wherein these protectants invoke growth regulatory effects. These chemicals also afford new means of probing biochemical mechanisms for herbicidal action on plants. Such investigations will undoubtedly aid in further studies to improve food production.

78-2507. Jordan, D. (Author address not given) **The town dilemma.** *Environment* 19(2): 6-15; 1977.

The city of Bloomington, in southern Indiana, is struggling with the environmental, health, and legal problems brought about by the local contamination of polychlorinated biphenyls. Westinghouse Electric Corporation has been found to be responsible for the contamination; it uses polychlorinated biphenyls in a dielectric insulating fluid in its manufacture of capacitors. Polychlorinated biphenyls have been identified in air discharges from the plant, as well as in stormwater runoff from the plant and in discharges to the city sewage system. Because many farmers and gardeners in the area use the nutrient rich sewage sludge as fertilizer, livestock, crops, and milk have been contaminated to a higher level than the FDA's tolerance level. The drinking water of a town 20 miles south of Bloomington has been found to be contaminated. The legal and political actions involved with this contamination problem are also discussed.

78-2508. Orrenius, S.; Moldeus, P.; Thor, H.; Hogberg, J. (Dep. Forensic Med., Karolinska Inst., S-10401, Stockholm, Sweden) **The physiological implications of drug oxidations to the cell.** In: *Microsomes and Drug Oxidations,* Ullrich, V., Roots, I. Hildebrandt, A., Estabrook, R. W., Conney, A. H., eds. (New York: Pergamon Press): pp. 292-306; 1977. (32 references)

This overview points out some of the physiological significance of drug oxidations to the cell. A number of possible implications are mentioned such as protection against drug toxicity by binding and metabolism through the cytochrome P450 system; competition between drugs and endogenous substrates for common enzymes, oxygen and cofactors; and the formation of reactive and toxic drug metabolites. [From Proceedings of the Third International Symposium, Berlin, 1976; published as a supplement to *Biochem. Pharmacol.*].

78-2509. Kalra, R. A. (Dep. Entomol., Punjab Agric. Univ., Ludhiana, India) **Pesticides residues - their implications and the job of a residue analyst** *Pesticides* 11(10): 13-17; 1977. (17 references)

Toxicological and environmental implications of pesticide residues, including the accumulation and storage in tissues of substances such as arsenic, lead, mercury, selenium, and organochlorine pesticides, and the possibility of carcinogenicity due to pesticides are discussed. Other issues considered are the reproductive failure of some bird species due to organochlorine compounds, and fish mortality due to contamination of the water by pesticides. The significance of metabolites and contaminants as terminal residues, the legislative control of pesticides, and the job of a residue analyst are discussed.

78-2510. Duke, T. W. (US EPA, Gulf breeze, FL) **Pesticides in aquatic environments. An overview.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed. (New York: Plenum Press): 1-8; 1977. (2 references)

In a general review of the topic of pesticides in aquatic environments, the aquatic environment focused upon includes rivers, streams, lakes, estuaries, and coastal and deep ocean waters. The effects of concentration, dilution, and degradation of pesticides on their transport and fate in the aquatic environment are discussed. To decrease the detrimental effects that pesticides have on non-target aquatic organisms, it is suggested that the compounds used should have low persistency, low toxicity, and should be specific for the intended purpose. Suspended particulate and solid material should be analyzed in water samples to determine residues. The issues dealt with during the symposium include extrapolation from laboratory studies to the natural environment, the need to place pollutants in general categories for prediction of effects, and the need for recognition of particularly vulnerable processes in the aquatic system. [Proceeding of a symposium for the International Congress of Entomology, Washington, DC, Aug. 22, 1976.]

78-2511. Tuske, M. ; Matolcsy, G. (Res. Inst. Plant Protect., Budapest, Hungary) **Recent trends in pesticide development.** *Proc. Hung. Annu. Meet. Biochem.* 16: 139-141; 1976.

The types of "third generation" insecticides are briefly outlined that meet today's rapidly growing requirments for greater selectively, optimal stability, nontoxic residues and low level toxicity. These types include entomopathogens, inhibitors of chitin synthesis, feeding- and oviposition-inhibitors, pheromones and antipheromones, juvenily hormone analogs, juvenile hormone antagonists, molting hormone antagonists and chermosterilants.

78-2512. Buss, H. (Landesanst. Umwelt, D-62 Wiesbaden, Germany) **Pestizidprobleme tropischer Laender, (Auswirkungen auf die BRD). [Pesticide problems in tropical countries (effects on West Germany).]** *Qual. Plant. Plant Food Hum. Nutr.* 27(1): 53; 1977. (German)

Only about 5% of the entire world production of pesticides is used in tropical and subtropical countries. Intensification of production and therefore increased use of pesticides for crop enhancement and storage protection is anticipated. Problems which may arise in this connection include prob-

lems of manufacture, toxicologic evaluation, quality control, advice to users, protection of the general population and applicators from direct exposure during application, residue standardization, and export problems caused by residue monitoring in the importing countries. Means of handling these problems differ greatly from one country to another.

78-2513. WHO, Geneva, Switzerland **Chemistry and specifications of pesticides.** *WHO, Tech. Rep. Ser.* 620: 1-36; 1978. (22 references)

Pesticide specifications and their use in public health are considered along with new or revised specifications for the WHO mannual *Specifications for pesticides used in public health.* Also presented are guidelines for improving the specifications of new types of formulations and active ingredients. Chemical pesticides continue to be the major part of most public health vector control programs. The compounds bromophos, jodfenphos, chlorphoxim, and primiphos-methyl have been examined and merit consideration for the establishment of specifications. Intensive research being carried out to develop new insecticides for use in controlling larvae of the *Simulium damnosum* complex is noted. Details of a poisoning incident which occurred in 1976 during the application of malathion water- dispersible powder during malaria control operations in Pakistan are reported and reviewed. Specifications for synthetic pyrethroids, insect growth regulators, and controlled release formulations are discussed. Attention is also given to rodenticides, molluscicides, and impurities in pesticide formulations. Methods for general use in specifications as well as standards for use in analytical procedures are noted. Collaboration between WHO and other organizations is described. Recommended changes in specifications are given for DDT, methoxychlor, HCH, pyrethrum, diazinon, malathion, trichlorfon, fenthion, dichlorvos, fenitrothion, propoxur, and temephos. Interim specifications are given for bromophos, jodfenphos, chlorpyrifos, and other compounds.

78-2514. Czuchajowska, Z. (Inst. Hortic. Prod., Agric. Univ., Krakow, Poland) **Adsorpcja i desorpcja jako czynniki modyfikujace selektywne dzialanie linuronu. [Adsorption and desorption as factors modifying the selective effect of linuron.]** *Acta Agrar. Silvestria Ser. Agrar.* 17(2): 3-22; 1977. (16 references) (Polish)

Investigations were conducted on the behavior of linuron in soil covered with thin layers of several types of sorbents, including activated carbon. Linuron was determined chemically and by bioassay. The IR spectra of soil-linuron and sorbent-linuron systems were examined to assess the occurrence of hydrogen bonding and thus the occurrence of interactions of he chemical sorption type. The distribution of suitable sorbents, e.g., activated carbon, on the soil surface in a very thin layer effectively protected the test plants from the action of linuron. Only traces of linuron were found in the 12-15 cm soil layer after this treatment. Chemical determinations indicated higher linuron contents than the bioassays; this was a result of herbicide sorption. The existence of hydrogen bonding was confirmed by the shifts in specific absorption maxima in the IR spectra of the soil-linuron system.

78-2515. Hoffmann, D.; Wynder, E. L. (Author address not given) **The effects of air pollution. Chapter 6. Organic particulate pollutants - chemical analysis and bioassays for carcinogenicity.** In: *Air Pollution.* Stern, A. C., ed. (New York: Academic Press) 2: 361-455; 1977. (337 references)

Studies have been made of the pollutants in the air which can be related to the use of pesticides by man. In 1963 and 1964 particulate air pollutants were collected in eight agricultural communities and in four communities with active insect control programs. DDT, chlordane, aldrin, toxaphene and malathion were found in these investigations. In studies of the air in Pittsburgh, Pennsylvania, it was noted that in summer values of DDT up to 2.5 $\mu g/1000\ m^3$ were found. Trace amounts of DDT, DDE, DDD (TDE), and dieldrin were reported in London air. DDT and DDE were also found in airborne dust in the northeast Atlantic Ocean and in the trade winds at Barbados, West Indies. Concentrations of thirteen pesticides in the air in orchards surrounding Montreal, Canada were also investigated. During fogging these pesticides rose to cncentrations of 0.05 to 7.7 $\mu g/m^3$ of air. In a study of four cities in California, DDT concentrations during October 31 and December 6, 1963 were 0.5 to 19 $\mu g/1000\ m^3$ of air. Pesticides in the air derive not only from fogging of pesticide preparations, but also from vaporization into the air of insecticides from field soils. Some insecticides in the air may become chemically converted or become metabolically activated into substances toxic or carcinogenic to the mammalian cell.

78-2516. Lewis, R. G. (Author address not given) **Sampling and Analysis of Airborne Pesticides (Chapter 3).** In: *Air Pollution from Pesticides and Agricultural Processes.* Lee, R. E., Jr., ed. (Cleveland: CRC Press): pp. 61-94; 1976. (232 references)

Single sampling systems for collecting different pesticides from ambient air and investigations concerned with the determination of various individual pesticides in the air are reviewed. Accumulative samplers include such things as filters, impactors, scrubbers, bubblers, liquid impingers, cloth screens, liquid supported on solid substrates, solid sorbents and freeze traps; reactive samplers, continuous and sequential samplers, and grab sampling are also discussed. Biological sensors can be used to detect airborne pesticides; these can be an insect, a microbe, or an isolated enzyme. Personal monitors, drift measurement, and calibration of air samplers are also discussed. It is concluded that no method has been developed that is generally accepted for the measurement of pesticide residues in air; several sampling systems may be necessary to monitor ambient air.

78-2517. Kutz, F. W.; Yobs, A. R.; Yang, H. S. C. (Author address not given) **National Pesticide Monitoring Programs (Chapter 4).** In: *Air Pollution from Pesticides and Agricultural Processes.* Lee, R. E., Jr., ed. (Cleveland: CRC Press): pp. 95-136; 1976. (47 references)

National air pesticide monitoring programs, suburban air sampling programs, and other ambient monitoring programs are reviewed. In the past, pesticide levels in the air have been monitored by filtering particulate material, by impinging air on impaction discs, and analysis of rain water. In the present study ambient air was collected in different states with an ethylene glycol impinger sampler, and analyzed for pesticides. Aldrin was found to decline during the 3 year study; lindane, diazinon, heptachlor, dieldrin, and methyl parathion remained constant, and malathion residues were variable. Suburban air was sampled for chlordane, heptachlor, and other chemicals associated with these pesticides; residues of the pesticides were found in each suburban location studied. Other programs monitoried humans, food and feed, the oceans, birds, fresh water fish, surface water, and soils.

78-2518. Sasaki, S.; Watabe, K.; Suzuki, Y.; Hayashi, S.; Sugaya, T. (Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan) **[Residual amount of organochlorine pesticides in human body.]** *Akita-ken Noson Igakkai Zasshi (Akita J. Rural Med.)* 24(2): 9-13; 1978. (3 references) (Japanese)

Organochlorine pesticide residues in human milk, adipose tissue, and organs obtained from a Japanese rural hospital were determined from April 1976 to March 1977. Organochlorine pesticide residues were detected in almost all specimens, and β-BHC and *p,p'*-DDE had a detection frequency of 100%. Each residue level was slightly lower than that reported for the previous year, but this difference was not significant. On gas-chromatographs of the specimens, other organochlorine compounds could be detected. In human milk, β-BHC had as its highest value 2.836 ppm; the average was 1.603 ppm. The highest value of *p,p'*-DDE detected was 4.44 ppm, and the average level of DDT was 2.248 ppm.

78-2519. Rautapaa, J.; Pyysalo, H.; Blomqvist, H. (Agric. Res. Cent., Inst. Pest Inv., SF-01300 Vantaa 30, Finland) **Quintozene in some soils and plans in Finland.** *Ann. Agric. Fenn.* 16: 277-282; 1977. (5 references)

Pentachloro nitrobenzene (PCNB, quintozene) residues varying from 0.05 to 27.0 mg/kg were found in forest type nurseries known to have been treated by PCNB. Residues in cereal and clover fields were, in general, smaller than those in forest tree nurseries. The highest residue was found in a field which was treated during ten successive years with 50 kg AI of PCNB. About half the PCNB used in this area was left in the soil. PCNB residues in cereals and clover were small, the highest being 0.14 mg/kg in winter wheat. The Finnish Pesticide Regulation Unit has suggested a tolerance of 1.0 mg/kg for PCNB in agricultural products. In general the soil samples had residues of PCA and MTPCB which were higher than those of HCB, TCNB, or PECB, which did not exceed 0.1 mg/kg. PCNB does not appear to have accumulated in the agricultural soils even after use of several years duration. However, it is suggested that PCNB not be used as a soil-improving agent in fields or glass-houses where vegetables are cultivated.

78-2520. Van Haver, W.; Vandezande, A.; Gordts, L. (Inst. Hyg. Epidemiol., B-1050 Brussels, Belgium) **Organochloorpesticide residu's in enkele voedingswaren: produkten van dierlijke herkomst. [Organochlorine pesticide residues in a few foods: food products of animal origin.]** *Arch. Belg. Med. Soc. Hyg. Med. Trav. Med. Leg.* 35(1-2): 128-139; 1977. (5 references) (Flemish)

Meat and meat products (56 meat samples, 11 samples of processed meat and 16 sausage samples) were analyzed by gas chromatography for their content of HCB (hexachlorbenzene), α, β, and γ-HCB, heptachlor epoxide, DDE, Dieldrin, DDT, and PCB's. The analytical methods were described and the results tabulated separately for pesticide content in fat and whole food. All meat samples contained some pesticide residues. Dieldrin was present in meat but not in sausages and processed meats. HCB was found in practically all meat samples and in smaller quantities in sausages and processed meat samples. DDT was present in only a few samples, TDE in some, DDE in many. Heptachlor epoxide was found predominantly in meat. PCB's, where found, were well below 0.1 ppm. A gradual reduction of these residues is expected from the termination of the use of some organochlorine pesticides and from gradual decontamination of the soil.

78-2521. Priebe, K.; Karow, S.; Schuetz, E. (Staatl. Veterinaeramt, Bremerhaven, Germany) **Zum gehalt der Muskulatur an Quecksilber und chlorierten Kohlenwasserstoffen von Rotbarschen. [Mercury and organochlorine levels in redfish muscle.]** *Arch. Lebensmittelhyg.* 29(2): 44-48; 1978. (18 references) (German)

Mercury, DDT and PCB levels were examined in 3 groups of redfish, 8 fish per group, captured in deep and shallow waters in the vicinity of Iceland. Fish were grouped according to size (length, body weight) as well as species (shallow water species, *Sebastes marinus* L. or deep water species, *Sebastes mentella* Travin). All mercury values were below 0.8 mg/kg except in one giant shallow-water redfish. Mercury levels were roughly correlated with size of the fish. The maximum total DDT value found (again in a shallow-water giant redfish) was 0.14 mg/kg, and thus DDT levels were far below the tolerance of 2.0 mg/kg established for fish. DDT levels were not significantly correlated with size of the fish. PCB levels did not vary significantly between individuals and were low compared to values reported in the literature for other fish species. The low contamination is probably due to the fact that redfish are caught in waters distant from pollution sources.

78-2522. Riebel, A.; Beitz, H.; Mende, G. (Inst. Pflanzenschutzforsch., Kleinmachnow, Biol. Zentralanst., Berlin, DDR) **Rueckstandsdynamik von Fensulfothion in Einlegegurken und Schnittsalat. [The dynamics of fensulfothion residues in cucumbers for pickling and in cutting lettuce.]** *Arch. Phytopathol. Pflanzenschutz* 12(1, S): 57-61; 1975. (4 references) (German)

Fensulfothion was applied to pickling cucumbers and to cutting lettuce in quantities of 3 to 25 g/m^2 and 3 to 12 g/m^2, resp. After metabolization, the active principle is reduced by oxidation to fensulfothion sulfon or its *O*-analog and then identification is made by thin layer chromatography. The active principle was more rapidly metabolized pickling cucumbers than it was in cutting lettuce. At an input quantity of 12 g fensulfothion/m^2, no residue was found in the cucumbers after a five week period, whereas with lettuce, the amounts of residue detected exceeded permissible tolerance values for vegetables (0.02 ppm) several times over.

78-2523. Rutter, I. (Pest Infest. Control Lab., Min. Agric. Fish. Food, Liverpool, England) **Pesticide residues in food arising from transport in freight containers.** *Chem. London* (14): 541-532; 1978. (3 references)

Residues of HEOD (dieldrin) along with γ-HCH (lindane), aldrin and endrin were found during a recent examination of imported cargoes for infestation. It was not likely that this combination of insecticides resulted from normal agricultural practice. Timber used for the construction of containers is often treated with preservatives to conform with the quarantine regulations in certain countries, and dieldrin had been used for that purpose. Use of these formulations on surfaces which come into contact with stored food is not recommended. Charcoal and peat were exposed in well-used freight containers, having floors of treated wood. After two weeks both materials had sorbed in excess of 2 mg/kg HEOD together with lesser amounts of other organochlorine residues. Carobs, groundnuts, flour and rice or soya beans were placed in several commodities containers. All forms of exposure showed that the commodities studied contained greater residues of the HEOD than unexposed materials. Lesser amounts of endrin, aldrin and γ-HCH were also found. Carobs were least sorptive.

78-2524. Young, D. R.; Heesen, T. C. (Author address not given) **Marine bird deaths at Los Angeles Zoo.** *Coast. Water Res. Proj. Annu. Rep.* :pp. 193-198; 1977. (3 references)

Nearly entire collections of Brandt's cormorants, guanay cormorants, and California gulls died in the Los Angeles County Zoo after apparent exposure to DDT. DDT residues in the dead birds were in the range found lethal to American kestrels in lab feeding studies. Zoo birds were exposed when fed fish collected in the general vicinity of Palos Verdes Peninsula. The brain and liver tissues of the zoo birds contained concentrations of total DDT and PCB that were two orders of magnitude above the mean values for the wild pelican specimens. In general, *p,p'*-DDE constituted more than 90% of the total DDT values obtained in the various samples. However, the PCB levels were an order of magnitude below those of total DDT in the affected birds. Thus while PCB's have contributed to the death of the birds, DDT was the major cause.

78-2525. Wolff, M. S.; Haymes, N.; Anderson, H. A.; Selikoff, I. J. (Environ. Sci. Lab., Mount Sinai Sch. Med., New York, NY 10029) **Family clustering of PBB and DDE values among Michigan dairy farmers.** *Environ. Health Perspect.* 23: 315-319; 1978. (4 references)

An apparent family clustering of serum PBB (polybrominated biphenyl) levels is reported; levels generally fall within a limited range for a family. Observations were made of 62 families during a survey of Michigan dairy farmers in November 1976. Results indicate that levels of serum PBB's cluster within family units and in children within families. Serum DDE clustering within families occurs only for children. These findings are consistent with the hypotesis of recent, temporary PBB exposure, perhaps from a common dietary source for families. Serum DDE indicates a lifetime, low-level exposure to DDT-DDE, which has been both less prolonged and less intense for the children.

78-2526. Wolff, M. S.; Aubrey, B.; Camper, F.; Haymes, N. (Environ. Sci. Lab., Mount Sinai Sch. Med., New York, NY 10029) **Relation of DDE and PBB serum levels in farm residents, consumers, and Michigan chemical corporation employees.** *Environ. Health Perspect.* 23: 177-181; 1978. (5 references)

PBB (polybrominated biphenyls) determinations were made on 524 Michigan dairy farm residents and on consumers of the farm products, as well as on 55 chemical workers and 56 Wisconsin farm residents. The chemical workers showed the highest mean and median values. They were followed by consumers from the residents of quarantined and nonquarantined farms. Serum DDE was similar for all groups with the exception of the chemical workers, where it was higher. Statistical analyses were performed on serum PBB and serum DDE levels with respect to quarantine status, age, sex, and obesity. Quarantine status was the most significant correlate with PBB. No consistent correlation was noted between serum DDE, age, sex, or obesity versus serum PBB. For DDE, however, age was invariably the most significant correlate. In males both serum PBB and DDE were higher than in females in husband-wife pairs in most cases. However, differences occurred less frequently among older age groups. It is suggested that PBB exposure was a recent temporary exposure, whereas DDE exposure has been cumulative throughout a person's lifetime. The finding of higher PBB and DDE mean concentrations in the serum of chemical workers suggests an occupational exposure to the chemicals.

78-2527. Wolfe, N. L. ; Zepp, R. G.; Gordon, J. A.; Baughman, G. L.; Cline, D. M. (Environ. Res. Lab., US EPA, Athens GA 30601) **Kinetics of chemical degradation of malathion in water.** *Environ. Sci. Technol.* 11: 88-93; 1977. (19 references)

Potential chemical and photochemical pathways for the degradation of malathion in lab experiments were studied. Acid degradation of malathion was shown to be too slow for importance under environmental conditions. Alkaline degradation is, however, fast enough to be a competitive degradation pathway in the environment. Products of alkaline degradation are dependent on temperature factors. Under acidic conditions oxidation by molecular oxygen is too slow to be a degradation pathway. In distilled water, photolysis is slow, but it may be important in natural water.

78-2528. Mahurani, G.; Julshamn, K. (Inst. Vitamin Res., Dir. Fish., Bergen, Norway) **Major and minor elements and some chlorinated hydrocarbons in Indonesian foodstuffs.** *Fiskeridir. Skr. Ser. Ernaer.* 1(2): 43-50; 1977. (12 references)

The levels of some chlorinated hydrocarbons, such as DDT and its metabolites and polychlorinated hydrocarbons, as well as major elements and trace elements were measured in seafood and terrestrial products in Djakarta, Indonesia. The levels of PCB and DDT and its metabolites were found to be extremely low; however, DDT was found in all samples. There was 0.041 mg/kg of total DDT in fruit, whereas total DDT in marine products was in the range of 0.002-0.051 mg/kg. The residues of PCB ranged from 0.001 to 0.024 mg/kg. The values for DDT were below the tolerance level recommended by FAO/WHO.

78-2529. Jarc, H.; Ruttner, O.; Humpelstetter, T.; Krocza, W. (Bundesanst. Virusseuchenbekaempf., Haustieren, Vienna, Austria) **Orientierende Untersuchungen zur Pestizidbelastung von Wildtieren und Haustieren in Oesterreich. [Orientation studies on the pesticide levels in wild and domestic animals of Austria.]** *Fleischwirtschaft* 57(10): 1868-2869; 1977. (6 references) (German)

A total of 290 samples taken from the meat and eggs of wild and domestic fauna were analyzed by gas chromatography for the presence of HCB (hexachlorobenzene), HCH (BHC), DDE, DDT, aldrin, heptachlor, dieldrin, endrin and PCNB. Test animals included rabbits, pheasants and partridges. Eight of the samples were from eggs. All values were below acceptable limits except in one egg, where the heptachlor concentration was 96 ppb, as compared with the legal maximum value of 50 ppb.

78-2530. Mueller-Wegener, U. (Intefak. Lehrgebict Chem., D-3400 Goettingen, Germany) **Uber die Bindung von *s*-Triazinen an Huminsaeuren. [Binding of *s*-triazines to humic acids.]** *Geoderma* 19(3): 227-235; 1977. (22 references) (German)

Three pesticides of the *s*-Triazine group (ametryne, prometryne and atrazine) were tested for their binding action with 10 humic acid samples extracted from a large variety of soils. The binding capacity of these various combinations depended first of all on the electron-donating properties of the insecticide, so that atrazine, which possesses a chlorine atom in the place of a methylthio group, has a lower binding affinity with the humic acids than the other two insecticides. Secondly, the binding properties of the humic acids vary in inverse proportion to the number of phenolic hydroxyl groups in the acid. In both cases the binding action depends on the formation of electron donor-receptor complexes.

78-2531. Avdyushkina, S. I. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polymers & Plastics, Kiev, USSR) **Eksperimental'noe obosnovanie predel'no dopustimoi kontsentratsii geksilura v vode vodoemov. [Experimental substantiation of maximum permissible concentration of hexilure in water bodies.]** *Gig. Sanit.* 43(5): 15-18; 1978. (6 references) (Russian)

The effect of herbicide hexilure (3-cyclohexyl-5,6-trimethylene uracil) on the organoleptic properties of water was studied. Hexilure changed the taste of water at minimum concentration of 0.15 mg/l (practical threshold was 0.8 mg/l). Complete degradation of hexilure at 1.0 mg/l and 10.0 mg/l was achieved within 5 mo and 8 mo, respectively. In a chronic toxicity experiment on rats, hexilure at 0.1 mg/kg (equivalent to 0.2 mg/l) significantly increased the functional activity of thyroid and inhibited erythropoiesis.

78-2532. Bolotnyi, A. V.; Pismennaya, M. V.; Akoronko, S. L. (All-Union Sci. Res. Inst. Hyg. & Toxicol. Pestic. Polymers & Plastics, Kiev, USSR) **Transformatsiya fosfororganicheskikh pestitsidov antio i khlorofosa v okruzhayushchei srede. [Transformation of organophosphorus pesticides anthio and trichlorfon in the environment.]** *Gig. Sanit.* 43(5): 28-31; 1978. (6 references) (Russian)

The persistence and metabolism of anthio (formothion) and trichlorfon in soil and plants were studied following the application of anthio in a dose of 1.2 kg/ha in 1,000 l/ha and of trichlorfon in doses of 2 and 6 kg/ha in 800 l/ha. Anthio was found in the air in a concentration of 0.0007 mg/m^3 on the day of the spraying. Anthio was present in the air for 7 days; and rogor (dimethoate), its metabolite, for 10 days. The anthio residues found in apples, apple-tree leaves and branches as well as in the soil under and between the trees one day after the spraying were 0.12, 0.93, 0.55, 0.17 and 0.13 mg/kg, respectively. The corresponding rogor residues were 0.22, 3.01, 2.3, 0.79 and 0.63 mg/kg, respecitvely. Residues of anthio and rogor were not found at the time of harvesting (60 days after spraying). On the day of trichlorfon application in a dose of 2 kg/ha, the residue levels found in the leaves and soil were 17.2 and 0.24 mg/kg, respectively, and only traces were found in the air. The leaves and soil contained 0.05 and 0.002 mg/kg of trichlorfon, respectively, 15 days after the spraying. No residues were found after 30 days. DDVP, a trichlorfon metabolite, was found in the leaves, soil and air until the 6th day after application in the respective concentrations of 0.03, 0.007 and 0.003 mg/kg. The trichlorfon and DDVP residues found after the application of trichlorfon in 6 kg/ha dose were higher. The findings indicate the intense metabolism of anthio and trichlorfon in the soil and plants.

78-2533. Vrochinskii, K. K.; Rak, L. V.; Shevchenko, M. A.; Taran, P. N. (All-Union Sci. Res. Inst. Hyg. & Toxicol. Pestic. Polymer & Plastics, Kiev, USSR) **Gigienicheskaya otsenka effektivnosti udaleniya pestitsidov - proizvodnykh mocheviny v protsesse vodopodgotovki. [Hygienic evaluation of the effectiveness of pesticidal urea derivative removal in water treatment.]** *Gig. Sanit.* 43(5): 106-107; 1978. (1 reference) (Russian)

The effectiveness of the usual drinking water preparation procedure, including chlorination, coagulation, settling and filtration, in the elimination of fenuron, diuron and kotoran as well as their metabolites (aniline, 3,4-dichloroaniline and 3-trifluoromethylaniline) from Dnepr River water was studied. These substances increased the permanganate oxidizability of the water, while 3,4-dichloroaniline and 3-trifluoromethylaniline also increased the odor intensity. Chlorination and coagulation caused only 10% reduction of the concentrations of the pesticides and their metabolites in the water. The chlorination of water containing the metabolites of the herbicides even caused an increase in the odor and color intensity of the water. The findings indicate that drinking water preparation plants do not constitute barriers for aryl alkylureas and their metabolites.

78-2534. Atabaev, Sh. T.; Zakladnoi, G. A.; Abdullaev, M. M.; Khasanov, Yu. U. (Uzbek Sci. Res. Inst. Sanit. Hyg. & Occup. Dis., Tashkent, USSR) **Gigienicheskaya otsenka primeneniya karbofosa dlya obrabotki zatarennoi muki. [Hygienic evaluation of the use of malathion for treating grain storage houses.]** *Gig. Sanit.* 43(5): 107-109; 1978. (2 references) (Russian)

The treatment of flour packed in cloth bags in storage houses with malathion was studied in a field experiment. Malathion spray was used in a dose of 300 mg/m^2, the liquid expensiture was 0.05 l/m^2. The malathion concentration in the work area was 0.77 mg/m^3 on the day of the treatment, versus a MAC value of 0.5 mg/m^3. The concentration dropped to 0.26 mg/m^3 on the second day, and further to 0.03 mg/m^3 on the seventh. Swab smears from the skin and clothes of the workers revealed that the contamination drops to acceptable level 3-5 days after treatment, at which time work in the storage house can be resumed. The malathion residue found in the outer 2-cm layer of flour in the bag was 1.39-1.68 mg/kg on the treatment, but the bread baked from such flour was free from malathion. The malathion residue level in the

flour dropped to below the maximum allowable concentration by the 12th day. The findings indicate that bagged flour can be safely treated with malathion in a dose of 300 mg/m^2 for pest control.

78-2535. Heinisch, E. (Forschungsstelle Umweltgestaltung, Akad. Wiss. DDR, DDR-1162 Berlin-Friedrichshagen, DDR) **Einsatz von Agrochemikalien und hieraus sich ergebende spezielle Probleme des Umweltschutzes. [Use of agricultural chemicals and resulting special problems of environmental protection.]** *Hercynia* 13(1): 1-15; 1976. (16 references) (German)

Agricultural chemicals can primarily be divided into two classes, fertilizers and pesticides. Following a survey of problems caused by application of fertilizers, the results of a study performed 10 yr ago on pesticide contamination of agricultural soils are updated. Approximately 130 pesticidal active ingredients are manufactured, formulated, or imported in the DDR; ten compounds account for *ca.* 85% of the total amount of pesticides applied. Within the past 10 yr the use of DDT has gradually been restricted to exceptional problems. In 1973, 11 yr after the last DDT treatment, DDT residues of 2.5-60 ppb were detectable in 14/24 soil samples with known treatment history. Residues of DDT in orchard soil samples declined from a maximum of 15 ppm following the last DDT application in 1965 to an average of 0.5 ppm in 1973. The formulation had a great effect on the soil penetration and persistence of DDT and the uptake of DDT by plants. Plant species also varied greatly in their DDT residue contents.

78-2536. Commoner, B. (Cent. Biol. Nat. Syst., Washington Univ., St. Louis, MO) **Chemical carcinogens in the environment.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 49-71; 1977. (8 references)

It has been estimated that in the USA 75-80% of the cancer incidence is of environmental origin. The majority of the known carcinogens present in the environment are the result of synthetic organic chemicals. One group of compounds used as pesticides evaporate into the air as they dry on plants and soil after application. Some of the pesticidal chemicals also get into the air at the manufacturing plants and affect those who are working with the chemicals at this level. Other cases of exposure to carcinogenic pesticides result from accidental spills, improper disposal of waste water from the manufacturing plants, or agricultural runoff. Combustion of pesticides adds to environmental contamination. While it is becoming essential to detect, identify and trace the origins of these various chemicals found in the environment, this is not an easy task. Similarly the task of proving carcinogenicity of a compound is not quickly performed. However, a recent advancement in the field of bacterial mutagenesis has enabled a faster method for toxicity determinations. Samples can be rapidly screened for bacterial mutagenesis by the *Salmonella* method which has become an effective screening technique for presumptive carcinogens. Urine from various individuals in the population can be analyzed to determine whether the proximally active metabolites of the presumptive carcinogens detected in the environment are in the urine. However, substances such as DDT and PCB's stimulate hydroxylase activity in the rat liver and this complicating factor must be taken into consideration in conducting bacterial mutagenesis tests, as rat liver microsome preparations are made for use in the *Salmonella* test.

78-2537. Kleopfer, R. D. (US EPA, Region VII, Kansas City, KS) **Analysis of drinking water for organic compounds.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H. ed. (Ann Arbor: Ann Arbor Science): pp. 399-416; 1977. (14 references)

Techniques available for the determination of organic pollutants in drinking water supplies were used in the Evansville, Indiana and EPA Region VII areas. Carbon adsorption methods and resin adsorption techniques were employed for detection of occurrence and significance of trihalomethanes. In the Evansville, Indiana study, the presence of the trihalomethanes, bromodichloromethane, chlorodibromomethane, and bromoform, was particularly interesting in that these compounds were found in drinking water but not in original Ohio River water. In EPA region VII analyses, the presence of the herbicides atrazine, lasso (alachlor) and Dacthal (DCPA) was noted. These compounds are present in the raw water and are not completely removed by the treatment process. Trihalomethanes were also present in the drinking water but were not present in the raw water supply.

78-2538. Loy, E. W., Jr.; Brown, D. W.; Stephenson, J. H. M.; Little, J. A. (Southeast Environ. Res. Lab., US EPA, Athens, GA) **Uses of wastewater discharge compliance monitoring data.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 499-516; 1977. (17 references)

Point sources which discharge into navigable waters of the United States are required by law to have a permit for such discharging. These point sources include large agricultural feedlots and return irrigation flows among others. The permit includes information concerning effluent limitations. A surveillance program is written into the law which allows Compliance Monitoring studies to be made to determine compliance with requirements. Various studies have been made in the past due to complaints concerning peculiar tastes and odors in the drinking water supplies. One such investigation is described in which the offending plant was discharging isomers of dichlorobenzene, ethyl parathion and methyl parathion. Other studies are discussed including the identification of 22 organic compounds found in finished and raw water supplies in Miami, Florida.

78-2539. Burlingame, A. L.; Kimble, B. J.; Scott, E. S.; Walls, F. C.; de Leeuw, J. W.; de Lappe, B. W.; Risebrough, R. W. (Space Sci. Lab., Univ. California, Berkeley, CA) **The molecular nature and extreme complexity of trace organic**

constituents in southern California municipal wastewater effluents. In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 557-585; 1977. (18 references)

Gas chromatography high-resolution mass spectrometry is used to facilitate analysis of complex mixtures, initially using packed gas chromatographic columns, and more recently using glass surface-coated open tubular capillary columns for high-resolution separations. The use of this technique for analyzing wastewater extracts from a Southern California municipal sewage treatment facility is described. It was concluded from these studies that florisil column separation of 6% and 15% ether:hexane fractions which separates PCB's, and DDT's from dieldrin, aldrin, and other contaminants, did not yield any further information than would have been obtained from a mixture of these fractions using HRGC/HRMS. From the entire study it was concluded that the use of HRGC/HRMS was effective in defining the scope of compound classes of organics present at various treatment stages in effluents of municipal sewage treatment plants.

78-2540. Brownlee, B.; Strachan, W. M. J. (Canada Cent. Inland Waters, Burlington, Ont., Canada) **Persistent organic compounds from a pulp mill in a near-shore freshwater environment.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 661-670; 1977. (6 references)

A study was made during July and August of 1974 of persistent organic compounds from a pulp mill in a near-shore freshwater environment. The effluent from the mill enters the Nipigon Bay as a point source. The study was primarily concerned with determining whether organic compounds could be detected in the water at a distance of 5 km from the point source. Sixteen organics identified in the mill effluent are listed; others were found but not identified. Hexachlorobenzene was identified in one of the samples taken from one of the sampling locations. Dehydroabietic acid was found in most of the water samples, all sediment samples, and a few seston samples.

78-2541. Agnihotri, N. P.; Pandey, S. Y.; Jain, H. K.; Srivastava, K. P. (Div. Agric. Chem., Indian Agric. Res. Inst., New Delhi 110012, India) **Persistence of aldrin, dieldrin, lindane, heptachlor and *p,p'*-DDT in soil.** *J. Entomol. Res.* 1(1): 89-91; 1977. (8 references)

The persistence of aldrin and lindane in soil is reported along with similar studies on dieldrin, *p,p'*-DDT, and heptachlor. Five percent dusts of each insecticide were mixed in the top 15 cm soil at the rate of 10 kg AI/ha. Initial residues were 2.40, 2.45, 2.90, 3.35, and 3.20 ppm, respectively, for aldrin, dieldrin, *p,p'*-DDT, heptachlor, and lindane. There was a rapid loss of all insecticides, and the quantities lost in 180 days were 97.7% lindane, 96.4% aldrin, 96.4% dieldrin, 94.8% *p,p'*-DDT, and 86.4% heptachlor. Conversion of aldrin and heptachlor epoxide was much gaster than has been reported in previous studies. Heptachlor epoxide was more persistent than the aldrin epoxide.

78-2542. Devel, L. E.; Turner, F. T.; Brown, K. W.; Price, J. D. (Dep. Soil & Crop Sci., Texas A&M Univ., College Station, TX 77843) **Persistence and factors affecting dissipation of molinate under flooded rice culture.** *J. Environ. Qual.* 7(3): 373-377; 1978. (7 references)

Pesticides, essential for the economical production of rice (*Oryza sativa* L), could pose a serious problem if transported to surface impoundments and estuaries along the Gulf Coast via the return flow associated with flooded rice culture. Field experiments were conducted under flooded rice cultivation to determine persistence and half-life were evaluated with respect to intermittent and continuous flow irrigation schemes at normal and excessive application rates of 3.4 and 11.2 kg/ha molinate, respectively. Persistence at statistically significant levels ranged from 96 to 384 hr following the application, and generally was more a function of the application rate than irrigation scheme. Half-life values averaged 96 ± 22 hr in intermittent flow plots and 54 ± 17 hr in continuous flow plots over the 3 yr experiment. Application rate had little effect on half-life. Best fit analysis of field data to the first order biological decay equation and laboratory studies under flooded soil conditions suggested that biological degradation was the principle mode by which molinate was dissipated in the field experiment. (Author abstract by permission)

78-2543. Barik, S.; Sethunathan, N. (Lab. Soil Microbiol., Cent. Rice Res. Inst., Cuttack 753006, India) **Biological hydrolysis of parathion in natural ecosystems.** *J. Environ. Qual.* 7(3): 346-348; 1978. (11 references)

Parathion (*o,o*-diethyl *o,p*-nitrophenyl phosphorothioate) was applied to flooded soils and to water and sediment river, lake, and pond samples at 15-day intervals. While *p*-nitrophenol (*o,o*-dimethyl *o,p*-nitrophenyl phosphorothioate), the hydrolysis product of parathion, was not detected, even at the end of 12 days after the first addition, it was detected in all samples within 6 hr after two or three additions of the insecticide. Enrichment cultures from the samples of different ecosystems lost their ability to hydrolyze parathion following autoclaving, suggesting microbial participation in parathion hydrolysis. (Author abstract by permission)

78-2544. Landsberg, J. D.; Bodyfelt, F. W.; Morgan, M. E. (Dep. Food Sci. Technol., Oregon State Univ., Corvallis, OR 97331) **Retention of chemical contaminants by glass, polyethylene, and polycarbonate multiuse milk containers.** *J. Food Protect.* 40(11): 772-777; 1977. (8 references)

Glass, polyethylene, and polycarbonate multiuse milk containers were treated with 29 common household chemicals to simulate consumer abuse. The chemicals included 10 pesticides and 7 herbicides. The containers were washed, sanitized, filled with homogenized milk, and stored for 10 days at 1°C. An on-line contaminant detector registered no contamination in milk stored in polyethylene containers which had been treated with water-based pesticides or herbicides, but the combination of container and milk did produce off odors. The detector registered a positive response

for polyethylene containers which had been treated with full-strength pesticides containing a petroleum-derived solvent. The polycarbonate containers were damaged and rendered unusable by treatment with pesticides containing a hydrocarbon solvent carrier or chlorinated organic constitutent. Containers treated with water-based pesticides did not register on the detector but did have off odors. None of the glass containers registered on the detector, and only one, treated with a full strength pesticide containing diazinon, had an off odor. Gas chromatography revealed virtually no volatile compounds in the treated glass containers, but compounds were present in the treated polyethylene and polycarbonate containers. Chlordane residues of 0.007, 24, and 14.6 ppm were recovered from milk placed in glass, polyethylene, and polycarbonate containers treated with full-strength chlordane. Neither the polyethylene nor polycarbonate containers appeared to comply with the Grade "A" Pasteurized Milk Ordinance of 1965 issued by the US Public Health Service.

78-2545. Mabey, W.; Mill, T. (Stanford Res. Inst., Menlo Park, CA 94025) **Critical review of hydrolysis of organic compounds in water under environmental conditions.** *J. Phys. Chem. Ref. Data* 7(2): 383-385; 1978.

Rate constants for hydrolysis in water of 12 classes of organic compounds are examined under conditions of controlled pH and temperature with the aim of using these data to estimate the persistence of these compounds in fresh water aquatic systems. Three important pesticides were included in this study: methoxychlor, captan, and atrazine. The half-life values for captan in both distilled and natural waters were found to be the same.

78-2546. Scifres, C. J. (Dep. Range Sci., Texas A&M Univ., College Station, TX 77843) **Herbicides and the range ecosystem: residues, research, and the role of rangemen.** *J. Range Manage.* 30(2): 86-91; 1977. (55 references)

The use of herbicides for range improvement over the past 25 years is reviewed. During this time herbicide use has become a progressively more sophisticated area of study. The fate of herbicides in range ecosystems is a complex area of study by virtue of the complexity of the ecosystem. The role of the atmosphere, ecosystem surfaces, vegetation, soil, and water in herbicide transfer and dissipation from the range ecosystem are discussed. When properly applied, herbicides applicable to range improvement programs provide excellent levels of weed and brush control without undue hazard to sensitive crops, man, livestock, or wildlife. In most cases, these herbicides are dissipated from the ecosystem during the growth season in which they are applied. Specific herbicides mentioned include 2,4-D, 2,4,5-T, silvex, picloram, and dicamba.

78-2547. Greenhalgh, R. (Chem. & Biol. Res. Inst., Agric. Canada, Ottawa, Ont, K1A 0C6, Canada) **IUPAC Commission on terminal pesticide residues.** *J. Assoc. Off. Anal. Chem.* 61(4): 841-868; 1978. (246 references)

This report of the proceedings of the tenth meeting of the IUPAC Commission on Terminal Pesticide Residues presents brief resumes of the current research. Research on terminal organochlorine insecticide residues include chlordane, heptachlor, endrin, aldrin, and dieldrin. Studies are also reported on toxaphene and the metabolism of lindane. Terminal organophosphorus pesticide residue studies were conducted using various animals, plants, and soils as well as studies specifically on the photodecomposition of fenitrothion. Terminal carbamate residues were studied using carbaryl, oxime carbamates, and *N*-nitrosocarbamates. Terminal pyrethroid residues were studied using bioresmethrin. Terminal herbicide residues were studied using nitroso-herbicides. Interactions of atrazine and nitrite in plant and animal systems were also investigated. Studies were made on propanil, ethephos, maleic hydrazine and maleic hydrazide. Terminal fumigant residues were studied including ethylene oxide, methyl bromide and the vapor phase photodecomposition of pesticides.

78-2548. Hsieh, B. T.; Huang, C. W. (Dep. Chem., Chung Yuang Christ. Coll. Sci. & Eng., Chung Li, Taiwan) **Accumulation of dieldrin, heptachlor and DDT on tea leaves.** *J. Chin. Chem. Soc.* 24(4): 199-204; 1977. (11 references)

Amounts of 0.1, 0.5, 1, and 2 ppm each of dieldrin, heptachlor, heptachlor epoxide and DDT were added to tea leaves and the leaves were macerated and passed through a GLC analysis regime. Average recoveries were 86.8%, 94.5%, 87.3%, and 81.5% for dieldrin, heptachlor, heptachlor epoxide, and DDT, respectively. Dieldrin accumulated to a maximum amount in about 2 to 4 wk and declined afterwards, probably due to leaching of the pesticides by rain. However, residues of DDT and heptachlor and its converted product appeared in only a few samples. Dieldrin was detected in all leaves, including those not treated with it. Thus dieldrin evaporated from the soil into the atmosphere and was subsequently absorbed in all the leaves. The limit of detectability was 0.005 ppm for dieldrin, 0.0005 for heptachlor, 0.005 for heptachlor epoxide and 0.005 ppm for DDT.

78-2549. Chian, E. S. K.; DeWalle, F. B. (Univ. Illinois, Urbana, IL) **Organics.** *J. Water Pollut. Control Fed.* 50(6): 1026-1061; 1978. (222 references)

Identification methods for pesticides and related compounds are listed. Compounds detected by these methods include PBB's, general pesticides, organophosphorus pesticides, trace PCB's, methoxychlor, *p*-dioxins and chloro dibenzofurans, fungicide residues, organochlorine compounds, chlorinated pesticides, dimilin, phenylurea herbicides, hexachloro cyclohexane (HCH), 1,3,5-triazine herbicides, phenylacetic acid herbicides, α- and β-BHC carbaryl derivatives, TCDD, parathion, DDT, petroleum products, paraoxon, 2,4-D, pentachloro benzonitrile, PCT's, toxaphene, hydrocarbons, chlorpyrifos, and aldrin. These methods allow the detection of the chemicals in paper mill effluent, water, vegetables, fruits, animal tissue, impure PCP, industrial formulated PBBs, citrus fruit, quail eggs, soil, sediment,

wastewater sludge, tap water, surface waters, natural water, river water, pond water, seawater, atrazine, fish, mother's milk, mice, rainbow trout, orange leaf wax, orchard soil dust, air, atmospheric deposits, field crops, bird livers, marine biota, aquatic microorganisms, mayflies, and sandy loam soil. Pesticide attenuation studies are also listed. Several studies did not that the biomagnification or accumulation in the food chain was proportional to the partition coefficient into a polar solvent and inversely related to its water solubility.

78-2550. Kowal, N. E.; Pahren, H. R. (US EPA, Cincinnati, OH) **Health effects associated with wastewater treatment and disposal.** *J. Water Pollut. Control Fed.* 50(6): 1193-1200; 1978. (96 references)

Possible hazards to health from the treatment and disposal of wastewaters are discussed. In a study of the pasture application of wastewater sludge containing large amounts of textile industry effluents, 1.2 ppm dieldrin, almost 19 times the acceptable level in The Netherlands, was found in the milk of grazing cows. Potential health effects associated with the use of tertiary effluents were also studied. The importance of residual viruses, organic chemicals and chlorination-generated carbinogenic halogenated hydrocarbons are discussed. A method of analysis for polynuclear aromatic hydrocarbons was investigated, and the significance of low PAH levels in raw and finished drinking waters was considered.

78-2551. Reish, D. J.; Kauwling, T. J.; Mearns, A. J.; Oshida, P. S.; Rossi, S. S.; Wilkes, F. G.; Ray, M. J. (California State Univ. Long Beach, CA) **Marine and estuarine pollution.** *J. Water Pollut. Control Fed.* 50(6): 1424-1469; 1978. (441 references)

Acute toxicological effects of the following pesticides are discussed: altosid (methoprene), azodrin (monocrotophos), binapacryl, carbofuran, chlordane, chlorpyrifos, copper sulfate, cutrine, DDT, diazinon, dinitrophenol, dinitrocresol (DNOC), dinocap, dinosam, dinoseb, endrin, endosulfan, formalin- malachite green, heptachlor, heptachlor epoxide, hyamine, Kepone (chlordecone), malachite, malathion, methoxychlor, methylene blue, methyl parathion, permethrin, and toxaphene. Sublethal effects of the following pesticides are presented: DDT, malathion, seven (carbaryl), sodium pentachlorphenate, guthion (azinphos-methyl), dursban (chlorpyrifos), dibrom (naled), methoxychlor, mirex, temofos, parathion, kelthane (dicofol), malachite green, altosid, dieldrin, aldrin, heptachlor, endrin, Kepone and DCMA. Bioaccumulation of the following pesticides by estuarine and marine organisms is reviewed: α-BHC, dieldrin, DDT, endosulfan, endrin, heptachlor, Kepone, methoxychlor, mirex, permethrin, and toxaphene. Environmental residues of the following pesticides found in sediments or water are listed: malathion, parathion, diazinon, dieldrin, mirex, DDT, DDE, DDD (TDE), toxaphene, aldrin, α-chlordane, γ-chlordane, and lindane. Environmental residues in biota of the following chemicals are listed: aldrin, DDD, DDE, DDT, dieldrin, heptachlor, heptachlor epoxide, lindane and parathion. Chemical residues reported from marine organisms include: aluminum, antimony, arsenic, barium, bismuth, cadmium, calcium, cesium, chromium, cobalt, copper, europium, gold, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, rubidium, scandium, selenium, silver, strontium, tin, titanium, vanadium, and zinc.

78-2552. Chkanikov, D. I.; Makeev, A. M.; Pavlova, N. N.; Nazarova, T. A. (All-Union Sci. Res. Inst. Phytopathol., USSR) **Ostatki 2,4-D v pshenitsi i kormovyhk zlakakh. [2,4-D residues in wheat and feed grains.]** *Khim. Sel'sk. Khoz.* (5): 51-54; 1978. (17 references) (Russian)

The residue levels of 2,4-D were studied in spring wheat, fescus and timothy grass following spraying with doses of 1 kg/ha (wheat) and 2 kg/ha (fescus and timothy grass) of ^{14}C-labeled 2,4-D. The 2,4-D level found in the plants during the first days after treatment was 43.5-56 mg/kg. The residue level halved during the first wk after treatment, and it did not exceed 3-4 mg/kg 3 wk after the application. However, in spite of the active metabolism of 2,4-D, up to 11 mg/kg was found in the ripe wheat grains. Along with intact 2,4-D, conjugated 2,4-D, hydrolyzed by hydrochloric acid, and hydroxylated derivatives were also found. The conjugates accounted for up to 40% of the total radioactivity. The 2,4-D concentration decreased in the feed crops due to dilution effect, to the formation of inactive metabolites, and mainly due to the loss of the treated leaves.

78-2553. Drewes, H.; Blume, H. P. (Inst. Oekol., Tech. Univ. Berlin, Berlin, Germany) **Abbau, Bewegung und Sorption von Herbiciden in Boeden. [Decomposition, migration and sorption of herbicides in the soil.]** *Landwirtsch. Forsch. Sonderh.* 33(2): 104-113; 1976. (German)

The herbicides pyrazon (phenylbutazone) and amitrole were studied in field and laboratory experiments. The field experiments were performed in 1973 and 1974, when 10 and 20 kg/ha of amitrole were applied to a crop of marrow-stem kale and 2.6 and 5.2 kg of Pyrazon were applied to a turnip crop. Climatic conditions and humus content were varied by the use of artificial irrigation and the addition of humus. Tritium-tagged water was applied simultaneously. The lab experiments consisted of a percolation test through columns of soil, the determination of Freundlich adsorption isotherms, and the determination of herbicide decomposition rates. Results indicate that under North German climatic conditions there would be insufficient translocation of these two pesticides to contaminate ground except in a sandy, low-humus soil in cool, damp weather or when the ground water level is high.

78-2554. Hussin, A. B. B. H.; Berry, S. K. (Fac. Agric., Univ. Malaya, Kuala Lumpur, Malaysia) **Determination of malathion residue on and in sawi (*Brassica juncea* C.) under Malaysian climatic conditions.** *Malay. Agric. Res.* 5(1): 47-55; 1976. (23 references)

Leaves of sawi which were sprayed at a concentration

of 15.5 g malathion/1 water were used to study the rate of degradation of the external and internal residues. The analysis of the external showed a level of 1411.7 ppm 1 hr after spraying, 860.2 ppm at 1 day, 215.3 after 4 days and 36.4 ppm after 7 days. The internal residue was 0.93, 69.87, 21.93, and 6.33 ppm at 0, 1, 4, and 7 day intervals after spraying, respectively. A first-order reaction kinetic pattern was followed by both internal and external residues. The half-life of the external and internal residue was 1.32 and 1.79 days, respectively, and the internal and external residues disappeared completely in 12 and 14 days, respectively. Thus the residue levels pose a hazard to the consumer, especially at higher concentrations. However, if the sawi is throughly cooked or refrigerated for longer periods prior to consumption, the hazard could be minimized.

78-2555. Miano, A.; Ciotti, F.; Roncuzzi, R.; Biasini, G. C. (Dep. Pediatr. & Obstet. Gynecol., M. Bufalini Hosp., Cesena, Italy) **Gli insetticidi nel latte materno. [Insecticides in breast milk.]** *Minerva Pediatr.* 30(6): 533-534; 1978. (4 references) (Italian)

Two samples of breast milk were collected from 16 mothers of the Romagna area of Italy, on two different days of the first week of nursing, and determinations were made for the content of hexachlorobenzene, total lindane (α and β BHC), heptachlor epoxides, and total DDT. Results indicated that 14 of 16 samples had higher HCB values than the limits set by WHO, 15 were above the lindane limits, and all 16 exceeded the permissible DDT level. The Romagna is a predominantly agricultural area, and DDT has been banned from use as a pesticide for many years. The use of heptachlor epoxides has also been illegal since 1973.

78-2556. Savage, K. E. (South. Weed Sci. Lab., ARS, USDA, Stoneville, MS 38776) **Availability and behavior of soil-applied herbicides.** *Miss. Agric. Exp. Stn. Tech. Bull.* 87: 1-10; 1977. (11 references)

Theoretical aspects of herbicide activity in soil are presented along with practical applications of the theory to rate selection, weed control, and crop damage. The effectiveness of a soil-applied herbicide depends on its availability for uptake by the weed species to be controlled. Herbicide molecules exist in the soil in a state of dynamic equilibrium with various soil components. Herbicides which are absorbed on surfaces of soil particles are not available to plants, whereas herbicides dissolved in soil water, and possibly those vaporized in soil air spaces, are available for plant uptake through absorption by roots or shoots. The content of water in the soil, therefore, is a significant factor in the amount of herbicide available to the plant. Various experimental situations were used as examples to show how the theoretical aspects of herbicidal activity may be useful in explaining, predicting, and preventing crop damage, and as a practical guide to obtaining better weed control through judicious selection of the appropriate herbicidal activity rate.

78-2557. Thurm, V. (Hyg. Inst., Wernigerode, DDR) **Untersuchungen ueber Pestizidrueckstaende auf Tabakwaren. 3. Mitt. Zum Uebergang von DDT und Dieldrin aus Tabakwaren in den Rauch. [Studies on pesticide residues on tobacco products. Part III. Passage of DDT and dieldrin from tobacco products into the smoke.]** *Nahrung* 21(4): 335-338; 1977. (13 references) (German)

The passage of insecticide residues contained in tobacco products into smoke as a result of the pyrolysis of DDT and dieldrin was studied. Cigarettes were contaminated by injection to contain 10 and 50 ppm DDT and dieldrin, respectively, and the smoke condensate from them was purified and analyzed by thin layer chromatography for their content of undecomposed DDT and dieldrin. In the case of contamination with 10 ppm DDT and dieldrin, 13.5 and 22.5% of these insecticides passed into the smoke unchanged. The balance passed into the smoke as decomposition products. Since residues exceeding the 1 ppm level are common in tobacco, heavy smokers may absorb considerable amounts of chlorinated insecticide residues which, while within the permissible limit of 5 μg/kg body weight, together with the decompositon products, may constitute an additional health hazard.

78-2558. Miyazawa, T.; Ito, S. (Dep. Agric. & Chem., Obihiro Univ. Agric. Vet. Med., Obihiro, Hokkaido, Japan) **[Studies on pesticide methyl thiophanate remaining in grass.]** *Obihiro CHikusan Diagaku Gakujutsu Kenkyu Hokoku, Dai-1-bu* 10(2): 515-521; 1977. (8 references) (Japanese)

The fungicide methyl thiophanate was sprayed on plots of orchard grass and ladino clover at the standard field application rate and at five times this rate. Residual methyl thiophanate concentrations were determined over a period of three months. In the plots treated with the standard amount, the residues were practically undetectable 2 wk after treatment. In the section sprayed with the fivefold concentration, residues had declined to less than 0.5 ppm in both orchard grass and ladino clover by 2 wk after application. After 3 mo the residues did not exceed 0.1 ppm in plants or in soil. The residue concentrations in the grasses examined were considerably below the limits established for fruits and vegetables.

78-2559. Strzelec, A. (Inst. Microbiol. Agric., IUNG, Pulawy, Poland) **Wplyw nawozenia mineralnego na rozklad simazyny w glebie. [Influence of the mineral fertilizing on the simazine degradation in soil.]** *Pamiet. Pulawski* 66: 131-139; 1976. (18 references) (Polish)

The influence of different NPK doses (0, 120, 240, and 480 kg/ha) added to a sandy soil treated or not treated with simazine (20 ppm S.A.) on the number of bacteria and fungi was studied. The mineral fertilizing of soil without simazine inhibited the development of the total number of bacteria but stimulated the development of fungi. Simultaneous application of the mineral fertilizing and of herbicide annihilated the unfavorable effect on the bacteria development both of fertilizers and of herbicide and exerted a favorable influence on soil fungi development. Mineral fertilizing inhib-

ited the rate of simazine degradation which decreased with the increasing NPK dose. After 12 weeks of the study most herbicide, 80%, underwent decomposition in the soil without NPK. Fifty percent of the herbicide underwent decomposition in the soil fertilized with 480 NPK kg/ha.

78-2560. Awasthi, M. D.; Kalra, A. N.; Dewan, R. S. (Div. Agric. Chem., Indian Agric. Res. Inst., New Delhi 110012, India) **Residues of insecticides in sugarcane juice and gur following chemical protection of crop from insects.** *Pesticides* 11(2): 33-34, 48; 1977. (9 references)

Twenty-three schedules of 8 different chemicals were evaluated from the view of toxic residues and consumer safety in sugarcane juice and gur following chemical protection of the crop from insects. Insecticides tested included: lindane, heptachlor, endosulfan, sevidol (carbaryl + lindane), monocrotophos, endrin, phorate, and carbofuran. None of the cane juice samples were found to contain any detectable residues of any of the chemicals involved. Of the gur samples only one sample which corresponded to heptachlor treatment was found to contain 0.6 ppm heptachlor residues with additional indication of the presence of heptachlor epoxide residues. The generally accepted tolerance limit for heptachlor in various commodities is 0.01 to 0.05 ppm and therefore the use of this chemical on this particular crop is questioned. Detectable residues of the other chemicals were not found in the gur samples.

78-2561. Saivaraj, K.; Thirumurthy, S.; Rajakannu, K.; Raguraj, R.; Subramanian, T. R.; Dhamodhiran, L.; Gopalakrishnan, C. V. (Pestic. Residue Unit, Dep. Entomol., Tamil Nadu Agric. Univ., Coimbatore 3, India.) **Carbaryl residues in maize fodder at feeding and at lactation in milch cows.** *Pesticides* 11(6): 36-37; 1977. (8 references)

The residues of carbaryl were estimated in maize and milk. The cultivar Deccan 5 was raised and sprayed four times with carbaryl at 0.1% concentration on the 15th, 25th, 35th, and 45th day of the crop with 500, 750, 1000, and 1000 l of spray fluid respectively per ha using a knapsack sprayer. The crop was harvested on day 45 soon after spraying and used as fodder for the experimental animals. The initial deposit of carbaryl was 52.4 ppm on the foliage. The chemical persisted only for five days indicating the rapidity of the total degradation resulting in a residue free crop. Traces of carbaryl were detected in the milk even on the first day of feeding. The residues in the fodder as well as in the milk rapidly declined within a period of five to six days indicating carbaryl was not accumulated like DDT or toxaphene.

78-2562. Edwards, C. A. (Rothamsted Exp. Stn., Herts, England) **Nature and origins of pollution of aquatic systems by pesticides.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed. (New York: Plenum Press): pp. 11-38; 1977. (29 references)

Characteristics of pesticides that cause pollution in aquatic systems include stability and persistence, toxicity to aquatic flora or fauna, high water solubility, uptake and bioconcentration into aquatic organisms, and heavy usage of a pesticide. Characteristics of aquatic systems that affect pollution by pesticides include the form and location of the system. Contamination by a pesticide can occur by spray drift, precipitation, drainage and run-off, industrial effluent, and by waste pesticides or containers that are dumped into the water. Pesticides have been applied to aquatic systems for fish eradication, and control of lampreys, aquatic snails, insect pests, and weeds. The level of pesticides in rivers, lakes, estuaries, and oceans are discussed.

78-2563. Haque, R.; Kearney, P. C.; Freed, V. H. (US EPA, Washington, DC) **Dynamics of pesticides in aquatic environments.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed. (New York: Plenum Press): pp. 39-52; 1977. (10 references)

The factors that influence the dynamics of a pesticide in the aquatic environment such as water solubility, hydrolysis, complex formation, adsorption to soils and sediments, partitioning into lipids, and bioaccumulation is the simplest parameter for predicting the adsorption characteristics of a pesticide in the aquatic environment. The water solubilities of pesticides range widely, but generally are within the ppm range. Pesticides can be removed from the aquatic environment by adsorption to soils and sediments. Physical and chemical characteristics of a pesticide, environmental conditions, and the nature of the aquatic organism all affect the bioaccumulation of the pesticide and thus, its transport in the food chain.

78-2564. Morley, H. V. (Agric. Canada, Ottawa, Ont., Canada) **Fate of pesticides in aquatic environments.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed. (New York: Plenum Press): pp. 53-74; 1977. (16 references)

The fate of PCBs, organochlorine pesticides, organophosphorus insecticides, and the herbicide atrazine in agricultural watersheds was examined. It was found that only atrazine and diazinon occurred in streams with regularity, but even these were found at low (ppb) levels. The fate of methoxychlor, which is used to eradicate the black fly, in a river ecosystem was studied by analyzing the movement of the insecticide in surface and subsurface water as well as residues in riverbed-load and fish. It appears that there is only a small amount of metabolism of methoxychlor by phytoplankton because, of all the potential sinks in the Great Lakes, methoxychlor residues are found to be the highest in the phytoplankton.

78-2565. Metcalf, R. L. (Dept. Entomol., Univ. Wisconsin, Madison, WI) **Model ecosystem studies of bioconcentration and biodegradation of pesticides.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed. (New York: Plenum Press): pp. 127-144; 1977. (15 references)

A terrestrial-aquatic model ecosystem with several food chains was developed to evaluate the environmental

problems related to the use of pesticides. The ecosystems consisted of an aquarium housing *Sorghum vulgare* plants, a lake with microorganisms, plankton, *Daphnia* sp., snails, algae, mosquito larvae, and the fish, *Gambusia affinis*. Radiolabeled pesticides were applied quantitatively to the Sorghum leaves at a dosage of 1.0 to 5.0 mg, equivalent to 0.2 to 1.0 kg/ha. Almost 100 pesticides have been evaluated in this model system, including DDT, DDD (TDE), DDE, methoxychlor, aldrin, dieldrin, endrin, lindane, mirex, hexachlorobenzene, chlordane, heptachlor, and heptachlor epoxide. The suitability of insecticides for vector control, screening of new insecticides, degradative pathways of insecticides, comparative metabolism of pesticides in different organisms, pesticide interactions, and molecular properties of the chemicals are studies using model ecosystem technology and radiolabeled molecules.

78-2566. Neely, W. B.; Blau, G. E. (Environ. Sci. Res., Dow Chem. USA, Midland, MI) **The use of laboratory data to predict the distribution of chlorpyrifos in a fish pond.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed. (New York: Plenum Press): pp. 145-163; 1977. (9 references)

The ability of laboratory data to predict field conditions is tested in a study to determine the level of chlorpyrifos in the water and in fish. The field study was conducted on ponds near Columbia, Missouri which has been sprayed with chlorpyrifos at the rate of 0.05 to 0.1 lb/acre. After treatment, water samples and fish were collected and analyzed. Computer simulation experiments were carried out in the laboratory. It was found that the laboratory results agreed closely with the results obtained by observations in the field. It was concluded that predictions can be made about the effects that a new compound will have on the environment by the use of laboratory models.

78-2567. Engst, R.; Macholz, R. M.; Kujawa, M. (Zentr. Inst. Ernaehrung, Akad. Wissensch. DDR, Potsdam, DDR) **Metaboliten von Hexachloro cyclohexan isomeren (HCH) im menschlichen Blut. [HCH isomer metabolites in human blood.]** *Pharmazie* 33(2-3): 109-111; 1978. (24 references) (German)

Whole blood of 9 individuals exposed to BHC as production workers was extracted with hexane, eluted with an aqueous solution of K_2CO_3 and the organic extract resulting from the separation of phases and drying was analyzed by gas chromatography to identify and determine the BHC metabolites present. The analysis disclosed the presence of pentachlorophenol (PCP) and 2,3,4,4- and/or 2,3,5,6-tetrachlorophenol and lower chlorinated compounds in addition to 5-32 ng HCB (hexachlorobenzene), 20-180 ng α-BHC, 0-180 ng β-BHC and 12-200 ng γ-BHC/ml as a result of inhalation of the isomer mixture. The wide spread of values found is attributed to the varying degree of exposure of each individual in the production process. While the phenols identified clearly represent BHC metabolites, the non-hydroxylated compounds are thought to represent inhaled intermediary production compounds. The BHC metabolites were identified following methylation of the phenols by comparison of the relative retention times towards *o*-methyl-2,3,4,6 TeCP with the respective test substances.

78-2568. Kamata, T.; Neamtu, G. G.; Simpson, K. L. (Dep. Food Sci. & Technol., Univ. Rhode Island, Kingston, RI) **The pigmentation of rainbow trout (Salmo gairdneri) with hyppophae rhamnoides oil.** *Rev. Roum. Biochim.* 14(4): 253-258; 1977. (35 references)

Electron capture gas chromatography of *Hyppophae rhamnoides* oil fed to 20 rainbow trout in order to produce a pink pigment in their meat showed a concentration of 0.754 ppm for DDT and its analogs, and 0.016 ppm for PCB. The combined concentration was higher than that in soybean oil but much lower than that in herring oil. The test diet, which included the *Hyppophae rhamnoides* oil, was found to contain a total level of identified pollutants of 0.155 ppm, while the control diet contained only 0.058 ppm. This value of the test diet was lower than those of other commercial feeds tested.

78-2569. Morita, M.; Mimura, S. (Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan) **Determination of hexachlorobenzene in food.** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.)* 17(6): 419-422; 1976. (24 references)

A convenient method of hexachlorobenzene analysis as well as analytical results of a survey of Japanese food are presented. Gas chromatography equipped with an electron capture detector was used for the analysis. The contamination of food in Japan by hexachlorobenzene was found to be less of a problem than the contamination by organochlorine pesticides because levels of hexachlorobenzene were less than those measured for other countries and considerably less than allowable levels suggested by WHO. The presence of hexachlorobenzene appears to be a result of the production of pentachlorophenol (PCP). Hexachlorobenzene was also found as a contaminant in several fungicides manufactured in Japan.

78-2570. Beitz, H. (Author address not given) **Zur Kontamination der Atmosphaere mit Pflanzenschutzmitteln infolge von Pflanzenschutzmassnahmen. [Environmental contamination by pesticides used in plant protection.]** *Sitzungsber. Akad. Wiss. DDR Math. Naturwiss. Tech.* 2N/1978:113-128; 1978. (23 references) (German)

Atmospheric contamination resulting from the use of pesticides (through drift, evaporation of the active substances from the plant surface, soil and water, in the course of compounding of insecticides, through their application by spraying, aerial spraying, dusting etc., as a result of weather conditions) is discussed on the basis of studies published in the US with the view of proposing appropriate control measures which might be applied in the DDR. Thus aerial spraying of parathion yielded 20-25% of the concentration level found above the edge of the sprayed field at a distance of 400 m from the field. Under less than favorable conditions (wind velocity, temperature, volatility, concentration) up to 70% of the in-

secticide sprayed never reaches the area it is intended for. In the case of certain pesticides, the problem is compounded by photolytic reaction (such as the conversion of DDT or DDE in vapor phase by UV light to bi-and trichlorosubstituted PCBs). Cultures where the danger of atmospheric contamination is acute include large-scale fruit growing areas, wine growing areas and cotton growing areas. In the DDR a pesticide monitoring program is recommended for fruit growing and seed potato growing areas.

78-2571. Arnold, G.; Auch, D. (Author address not given.) **Dicamba drift.** *S. D. Farm Home Res.* 29(1): 12-13; 1978.

Experimentation is reported which documents the supersensitivity of soybeans to dicamba. Visual injury symptoms, however, do not necessarily indicate yield reduction. If dicamba is applied before soybeans are blooming, yield reduction can be minimized. Visual injury includes cupped leaves, bent stems, grayish leaf margins, and maturity delay. Leaf and stem injury appear 1 to 14 days after application. Plant height was not reduced by dicamba application at the 1 to 2 trifoliate or late pod stages. Early bloom stage applications caused the greatest height reductions. Dicamba application before podfill did not reduce germination of seed from injured plants. However, the 0.05 lb/A rate applied at the early pod stages in 1975 reduced seed germination and seedling emergence. Some varieties were less affected. Dicamba in soybean foliate can be detected by residue analysis.

78-2572. Miller, W. M.; Ismail, M. A. (Inst. Food & Agric. Sci., Univ. Florida, Lake Alfred, FL) **Removal of ethylene dibromide from citrus fumigation chambers.** *Trans. ASAE* 20(6): 1138-1141; 1977. (5 references)

Studies were undertaken to quantify the ethylene dibromide distribution in cartons and citrus fruit during fumigation, to test feasible concepts for recovery of post-fumigation expelled EDB, and to develop design data for such application. Initial concentrations of EDB vapor were 5.1 to 17.5 g/m^3. Adsorption by fiberboard cartons and citrus reduced this concentration by 1.4 to 6.0 g/m^3 depending on the initial EDB concentration. The majority of the EDB uptake (70% or more) was by the fiberboard of the carton. Activated carbon was successful in removing EDB. The relationship between the concentration and the amount of EDB adsorbed by the activated carbon could be predicted by a power law relationship. Field experiments confirmed that the relation could be used to determine quantities of activated carbon needed for large scale recovery units.

78-2573. Grel', E. V.; Ryabinin, A. I. (Author address not given) **Izuchenie skorosti raspada DDT (periodov poluraspada) y morskoi vode. [Study of the rate of DDT Decomposition (half-life periods) in sea water.]** *Trudy Gos. Okeanogr. Inst.* 132: 68-72; 1976. (4 references) (Russian)

The rate of DDT degradation in sea water was studied. Pure DDT (50 mg) was dissolved in acetone (1000 ml) and diluted by sea water (inidial concentration of DDT was 0.5 and 5 μg/1). DDT determination in sea water samples was carried out every 10 days. The process of DDT degradation could be described by the equation of reaction kinetics of the 1st order. The half-life period for DDT at 5 μg/l was 150 days, compared to 90-95 days for 0.5 μg/l.

78-2574. Konstantinov, O. K.; Gorchakovskaya, N. N. (USSR AMS Inst. Poliomyelitis & Viral Encephalitides, Moscow, USSR) **Residues of DDT in biogeocenoses of taiga after application of DDT for control of *Ixodes persulcatus* P. Sch.** *Wiad. Parazytol.* 23(1-3): 253-254; 1977.

Taiga foci of tick-borne encephalitis were treated in different years with 10% DDT dust (50 kg/ha). Gas-liquid and thin-layer chromatography were used to analyze samples of soil, forest litter, and other natural substances for DDT residues. In the year of treatment, DDT residues in forest litter, soil, earthworms, and grass were 17.71, 0.60, 0.41, and 3.45 mg/kg, respectively, and the level in cows' milk was 0.07 mg/l. Within 3 yr after treatment, the residue levels decreased by 42 to 86%. In general, the DDT residue concentrations in the samples were not high, and toxic effects on animals were neither great nor long-lasting. However, it would be desirable to replace DDT with a less stable acaricide for the control of taiga ticks. At present the importance of tick control with acaricides calls for treatment and retreatment of encephalitis foci, the regulation of economic activity in treated territories, a search for effective substitutes for DDT, and methods of biological control.

78-2575. Nagai, I.; Oka, H.; Tasaka, M.; Akikawa, M.; Akikawa, M. (Yamaguchi Prefect. Inst. Public Health, Yamaguchi, Japan) **[Studies on harmful organic substances in foods. Pesticide residues and harmful organic substances in chicken meat, eggs, and chicken feed.]** *Yamaguchi-Ken Eisei Kenkyusho Nenpo (Ann. Rep. Yamaguchi Prefect. Inst. Public Health)* 19: 93-95; 1976. (Japanese)

The effects of pesticide residues in chicken feed on the meat and eggs of chickens were studied in four age groups of chickens from hatching to senescence. Total-BHC, total-DDT and dieldrin were determined in chickens fed on self-made, commercial, or mixed chicken feed, and chicken meats were collected from very young, young, adult, and senescent chickens. Chicken meats and eggs from birds fed on all three types of feed showed seasonal variations in pesticide residue levels. Birds fed on self-made feed had residues in chicken meats from very young, young, adult, and senescent fowls of 0.008, 0.002, 0.012, and 0.066 ppm respectively, for BHC, and 0.036, 0.011, 0.014, and 0.096 ppm, respectively, for DDT. No unusual effects were noted in the chickens as a result of the pesticide residues found.

78-2576. Thielemann, H.; Grahneis, H. (Hyg. Inst., Martin Luther Univ., Halle-Wittenberg, DDR) **Untersuchungsergebnisse zur Frage der Kontamination von Humanmilch mit Gesamt-DDT (DDT + DDE) im Stadtgebiet von Halle**

(Saale) im Jahre 1976. [Total DDT (DDT + DDE) contamination of human milk in the Halle area in 1976.] *Z. Gesamte Hyg. Ihre Grenzgeb.* 24(1): 68-69; 1978. (3 references) (German)

Total DDT content was determined in 587 individual milk samples from the Martin Luther University Children's Clinic collected from May-November 1976. The 587 milk samples were analyzed by TLC and semi-quantitative spot analysis. Results showed that 87.3% of the samples contained no detectable DDT. The maximum DDT value was 2.0 ppm and the lowest value was 0.25, with an average for all samples of 0.052 ppm DDT, as compared with the value of 0.25 obtained in the year 1973. The decreased use of DDT occurred as a consequence of government restrictions. After Jan 1, 1974, use was limited to a few hard core problems; after Jan 1975, to the individual treatment of trees in forestry work. After April 30, 1975, it was completely banned. The pesticide's insolubility in water and relatively high solubility in lipids accounts for the prolonged appearance of residues long after its use has been discontinued. Determination of DDT is difficult because of interference of a similar substance (Clophan A_{50}), used as a non-flammable lubricant in the electrical industry.

78-2577. Thiede, H. (Inst. Pflanzenschutz, Saatgutuntersuch. & Bienenkd. Landwirtschaftskammer Westfalen-Lippe, Muenster, Germany) **Erfahrungen mit Biotestpflanzen zum Nachweis von Herbizid-Rueckstaenden im Boden. [Experiences with the use of test plants as biological indicators of herbicide residues in the soil.]** *Gesunde Pflanz.* 29(10): 224-226; 1977. (6 references) (German)

Herbicides, such as the triazines and derivatives of urea and aniline, were biologically detected with test plants highly sensitive to these substances. Tests indicated that it is possible with the right plants to detect residues of herbicides used in a hot house. Of the 290 species and varieties studied, only a few were sensitive enough to serve as bio-indicators. The species *Brassica rapa* and *Gypsophila elegans* were both sensitive to atrazine, chlortoluron, methabenzthiazuron, metoxuron, monolinuron and terbutryn residues in sandy soil. *Gypsophila elegans* and *Trifolium repens* are both sensitive to Isoproturon, and *Setaria glauca* is sensitive to Penoxalin (pendimethalin). The main interest of the researchers was to determine the effect of carbazide residues on future crops, and to give guidelines in line with this concern.

78-2578. Reinhold, R. (Staatl. Kontrollinst. Seren & Impfstoffe, Berlin, Germany) **Zur Persistenz von Naled in kleinen natuerlichen Gewaessern (Stechmueckenbrutplaetzen). [Persistence of Naled in small natural bodies of water (mosquito breeding places).]** *Z. Gesamte Hyg. Ihre Grenzgeb.* 24(2): 119-122; 1978. (8 references) (German)

A series of 5 experiments was conducted in mosquito breeding sites to determine the persistence of the insecticide naled (phosphoric acid-dimethyl- 1,2-dibromo-2,2- dichloroethylester) and its metabolite, dichlorvos. Variations were made in the naled formula, mode of application, amount used, sampling procedures, and external conditions of the test surfaces. When a 4% aerosol formula was used in small natural bodies of water varying in surface area from 21 to 42 m^2 and in depth from 35 to 69 cm, with a theoretical starting concentration of 0.15 ppm, the naled concentration in two of the three test pools after 1 hr was 0.45 ppm. It was 0.15 ppm in one of the pools after 24 hr. Naled was still detectable at the end of three days. These were the highest persistence values obtained. When naled formulas are sprayed in quantities of 2.5 ppm or less under normal field conditions, one can expcet naled to persist for less than 24 hr; dichlorvos persists for 3 days in negligible quantities.

78-2579. Suess, A.; Pritzl, E. (Bayer. Landesanst. Bodenkult. Pflanzenbau, Munich, Germany) **Sorption, Abbau und Pflanzenverfuegbarkeit von Carbendazim. [Sorption, degradation and plant availability of carbendazim.]** *Z. Pflanzenkr. Pflanzenschutz* 84(6): 352-362; 1977. (15 references) (German)

Sorption of carbendazim was investigated in two different soils, a marly type and a sandy type, with and without addition to 5% ground apple leaves. The marly soil, which had a low pH, had a higher carbendazim sorption capacity than the sandy soil. The presence of ground leaves did not affect the sorption capacity. The extent of degradation to $^{14}CO_2$ after 19 wk was highest in the sandy soil, amounting to 11.5% in the absence of apple leaves, 5.8% in sandy soil with golden delicious leaves, and 8.1% in sandy soil with winter rambour leaves added. Only 1% of the carbendazim added was degraded to $^{14}CO_2$ after 19 wk in marly soil, with or without apple leaves. The ethanol extractability of the carbendazim residues decreased with increasing incubation time. No effect of carbendazim was observed on the overall CO_2 evolution of the soils. Carbendazim was taken up by plants grown in treated soils, but the plant availability of the carbendazim decreased with continuing incubation.

78-2580. Malkomes, H. P. (Inst. Unkrautforsch. Biol. Bundesanst. Land & Forstwirtsch., Braunschweig D-3300, Germany) **Verhalten der Bodenmikroflora nach Anwendung des Herbizids Venzar (Lenacil) zu Zuckerrueben. [Behavior of soil microflora after application of the herbicide Venzar (lenacil) to sugar beets.]** *Z. Plfanzenkr. Pflanzenschutz* 84(9): 516-525; 1977. (21 references)

In April 1973, sugar beet crops were planted in 3 types of soil (sandy loam, muck and clay), and the presence and activity of various microflora (bacteria, actinomyces, fungi and algae) was studied in September 1973 and in the spring and fall of 1974. In September 1973 the total aerobic bacteria population was 265% that of a control plot, in the layer of soil extending down to 10 cm. The actinomyces population was 328% of the control, and at a depth of 10 - 20 cm there was a 402% increase in fungal activity. Effects of the herbicide on microflora activity in the 1974 studies showed minor changes, strongly dependent on the type of soil. The most important changes in the 1974 dehydrogenase activity were in the sandy loam at a depth of 10 - 20 cm and in the muck in the top 10 cm of soil.

See also 78-2509, 78-2738, *and* 78-2740.

78-2581. Wright, J. W. (WHO, Geneva, Switzerland) **Insecticides in human health.** *Adv. Environ. Sci. Technol.* 6: 17-37; 1976. (21 references)

This review examines the present status of control of some of the major arthropod diseases and makes some attempt to determine their future significance, the possibility of achieving control of their vectors, and the means that will be required to accomplish this goal. The various diseases discussed include malaria, filariasis, dengue hemorrhagic fever, onchocerciasis, African trypanosomiasis, plague, and typhus fever. Methods for controlling these diseases other than through the use of insecticides include the genetic control of insect vectors of disease and the biological control of disease vectors.

78-2582. Barnes, J. M. (MRC Toxicol. Unit, Med. Res. Counc. Labs., Carshalton, Surrey, England) **Toxic hazards to man.** *Adv. Environ. Sci. Technol.* 6: 145-155; 1976. (23 references)

Toxic hazards of four main groups of insecticides are considered. These hazards can be divided into immediate effects related to the principle toxic action of the major compound; late effects such as teratogenesis, carcinogenesis, and mutagenesis; and other effects such as those which are identifiable or hypothetical and not the direct result of the principal toxic action. The four groups of insecticides considered include pyrethroids, organophosphorus anticholinesterases, carbamate anticholesterases, and organochlorines such as dieldrin, and DDT.

78-2583. Wolfe, H. R. (Author address not given) **Field exposure to airborne pesticides (Chapter 5).** In: *Air Pollution from Pesticides and Agricultural Processes.* Lee, R. E., Jr., ed. (Cleveland: CRC Press): pp. 137-161; 1976. (105 references)

Because airborne pesticides are a source of exposure to persons actively working with these compounds, the methods of exposure were studied. Pesticide applicators are exposed while using ground applicating equipment and during aircraft application of pesticides. Other human exposure occurs in farm workers handling treated crops, in workers in pesticide formulating plants and in residents near the source of airborne pesticides. A special exposure problem results from pesticide drift onto cigarettes and food during application. Sampling methodology and analysis for estimating human exposure to airborne pesticides in the field involves measurement of potential respiratory exposure, measurement of potential dermal exposure, and measurement of potential oral exposure. Factors affecting exposure include the type of activity a worker is engaged in, the pesticide particle or droplet size and formulation being used, climatic conditions, time exposed, and the attitude of the worker. Exposure can be decreased by dermal protection through the use of protective clothing, respiratory protection with respirators or gas masks, and oral protection by the use of face masks.

78-2584. Durham, W. F. (Author address not given) **Human health hazards of respiratory exposure to pesticides (Chapter 6).** In: *Air Pollution from Pesticides and Agricultural Processes.* Lee, R. E., Jr., ed. (Cleveland: CRC Press): pp. 163-176; 1976. (34 references)

Although the systemic effects of exposure to a pesticide are the same regardless of the route of exposure, which can be oral, dermal, or respiratory, the route of exposure can influence the rate at which a compound is absorbed. Methods of obtaining data on the toxicity of pesticides include animal experiments, volunteer studies, studies of highly exposed workers, and poisoning cases. The type of compound, its volatility, the dosage, and the particle size all affect the toxicity of a pesticide. The hazards involved in the use of chlorinated hydrocarbons are discussed with special reference to DDT. The organophosphorus group of insecticides, which act through the inhibition of cholinesterase thus allowing accumulation of acetylcholine, produces neurotoxicity effects. The carbamates, including carbaryl, carbofuran, propoxur, methomyl and aldicarb inhibit cholinesterase, but the reaction is reversible, so the toxic effect is short lived. Threshold limit values of a number of pesticides in air are given.

78-2585. Garvin, A. O. (Author address not given.) **Legislative control of pesticidal air pollution (Chapter 8).** In: *Air Pollution from Pesticides and Agricultural Processes.* Lee, R. E., Jr., ed. (Cleveland: CRC Press): pp. 217-226; 1976. (51 references)

Existing legislation that may be able to prevent or limit exposure to pesticide emissions consists of the Clean Air Act and the Federal Insecticide, Fungicide, and Rodenticide Act; however, this legislation was not designed to control air pollution from pesticides. The need for information on the nature and extent of pesticidal air pollution is stressed, since the usefulness of the existing legislation depends on the establishment of emission standards. Without scientific data on air pollution from pesticides, it is unclear whether pesticide emission standards are warranted.

78-2586. Kahn, A.; Blum, D. (Serv. Pediatr., Univ. Libre Bruxelles, Brussels, Belgium) **Etude comparee des intoxicationa aigues chez l'enfant belge et l'enfant du travailleur immigre. [Comparative studies of acute intoxication in native Belgian and immigrant laborer children.]** *Arch. Fr. Pediatr.* 35(4): 442-447; 1978. (9 references) (French)

The cases of 786 children admitted with acute poisoning to the Saint-Pierre Hospital in Brussels during the 1967-1976 period are surveyed. The children of immigrants from Spain, Turkey, Greece, Italy and Morocco accounted for 29% of the cases. Pesticides were the cause of the poisoning in 28 cases (20 Belgian and 8 immigrant children). Only 6 cases were fatal; none of them were caused by pesticides.

78-2587. Brankov, K.; Omanic, A. (Inst. Hyg., Social Med. & Occup. Med., Med. Fac., Sarajevo, Yugoslavia) **Aktivnost holinesteraze krvi kod poljoprivrednih radnika izlozenih organskofosfornim jedinjenjima. [Blood cholinesterase activity in agricultural workers exposed to organophos-**

phorus compounds.] *Arh. Hig. Rada Toksikol.* 28(4): 331-335; 1977. (11 references) (Serbo-Croatian)

Cholinesterase activity was measured in whole blood from agricultural workers occupationally exposed to organophosphorus pesticides. The highest cholinesterase activities in these studies were measured in viticulturists, next in male florists, and still lower in fruiterers. The lowest cholinesterase activities were measured in female florists. Cholinesterase activities measured before and after organophosphate exposure differed significantly in viticulturists and 35-45-yr-old agricultural workers. Cholinesterase activity was reduced 10-40% in 18 of the 49 workers examined. However, no clinical symptoms of poisoning by organophosphorus compounds were noted.

78-2588. Fitzek, A.; Gembardt, C. (Lab. Pharmakol. Toxikol., Fachber. Veterinaermed., Freie Univ. Berlin, Berlin, Germany) **Rodentizidintoxikation bei einer traechtigen Huendin. [Rodenticide intoxication in a pregnant German shepherd.]** *Berl. Muench. Tieraerztl. Wochenschr.* 90(5): 98-99; 1977. (9 references) (German)

A pregnant German shepherd consumed a unknown amount of Actosin P rat bait (active ingredients: warfarin and pindone). Although she displayed no symptoms of intoxication she was given 30 mg vitamin K iv on the day of poisoning and 40 mg on the following days. Four days after poisoning she delivered three whelps. One was dead at birth and another two died within a few hours. This dog was subsequently given a litter of collie whelps to nurse; one of these pups died of a bacterial infection. Pathological examination of the whelps born after intoxication revealed typical signs of anticoagulant poisoning. Warfarin and pindone were determined in plasma and liver sample. The plasma of the dam contained pindone at 1.4 μg/ml and no detectable warfarin; plasma concentrations of 1.6 to 2.0 μg/ml pindone and 1.8 to 2.8 μg/g warfarin were found in the whelps. Thus both pindone and warfarin are able to cross the placental barrier. Warfarin is rapidly converted to polar metabolites and excreted via the kidneys in adult dogs. Pindone is not rapidly metabolized, but vitamin K administration apparently prevented the development of hemorrhagic diathesis in the poisoned dam. The fetus apparently lacks the ability to metabolize warfarin, and placental transfer of vitamin K could not be demonstrated.

78-2589. Klemmer, H. W.; Reichert, E. R.; Yauger, W. L., Jr.; Haley, T. J.* (Natl. Cent. Toxicol. Res., Jefferson, AR) **Five cases of intentional ingestion of 25 percent diazinon with treatment and recovery.** *Clin. Toxicol.* 12(4): 435-444; 1978. (4 references)

Five cases of intentional ingestion of 25% diazinon, as well as treatment of the intoxication and recovery, are presented. The patients showed symptoms such as diaphoresis with sialorrhea, abdominal pain, muscle weakness, muscle twitching, nonreactive pinpoint pupils, and hyper-reflexia, all symptoms characteristic of cholinesterase inhibition by pesticides. The patients were treated promptly with atropine (to block the effects of acetylcholine), pralidoxime chloride (to restore cholinesterase in the blood), gastric lavage, and oxygen by face mask. All five cases were stabilized by this prompt treatment.

78-2590. Daunderer, M. (Toxikol. Abteil., Med. Klin. 2, Techn. Univ. Muenchen, Munich, Germany) **Vergiftungstherapie - Antidote. Folge 1: ABC der Vergiftungs-behandlung, Gegengifte (Antidote, Indikationen, Dosierung.) [Treatment of poisoning: antidotes. Series 1. ABC's of treatment of poisoning - antidotes, indications, dosages.]** *Fortschr. Med.* 96(25): 1313-1317; 1978. (German)

Guidelines for the administration of first aid designed to counteract the state of shock frequently resulting from the intake of toxic substances, for gathering information necessary for the choice of appropriate therapy and detoxification, and for transporting patients to hospitals are outlined. Presently known antidotes to known poisons are listed with indications and dosages. The list contains antidotes to poisoning with methyl alcohol, digitalis, alkyl phosphates, various insecticides, food poisons, water-soluble swallowed poisons, heavy metals, lye, acids, cyanide, hydrogen sulfide, opiates, radioactive Th and Ce, anticholinergics, psychodrugs, tranquilizers, neuroleptics, detergents, various industrial chemicals and coumarin.

78-2591. Malen'kii, V. P. (Med. Inst., Vinnitsa, USSR) **Kliniko-morfologicheskie issledovaniya pri zabolevaniyakh bronkholegochnoi sistemy sel'skikh mekhanizatorov. [Clinical-morphological comparisons in bronchopulmonary disorders in farm machinery operators.]** *Gig. Tr. Prof. Zabol.* (5): 12-17; 1978. (11 references) (Russian)

Clinical and morphological comparisons were made based on the results of general clinical examinations performed in over 200 farm mechanics with acute pneumonia and chronic nonspecific pulmonary infections. Biopsy and autopsy specimens obtained from farm machinery operators who died in accidents were also examined. Previous studies had indicated that the respiratory passages of farm machinery operators are heavily contaminated with soil and plant dusts. In addition to plant, soil and meteorologic factors, machinery operators are exposed to engine fumes and pesticides. The results of the examinations suggest that the acute forms of pulmonary pathology in farm machinery operators most commonly represent complications of chronic latent occupational bronchitis and pneumoconiosis. The illnesses are of mixed etiology and do not resemble the classical forms of farmer's lung.

78-2592. Rautskis, M. K. (Inst. Epidemiol. Microbiol. & Hyg., Vilnius, USSR) **Ob usloviyakh truda v sel'skokhozyaistvennom proizvodstve Litovskoi SSR. [Working conditions on farms in the Lithuanian SSR.]** *Gig. Tr. Prof. Zabol.* (5): 59-60; 1978. (Russian)

The proceedings of a 1976 scientific conference on the working conditions of farm workers in the Lithuanian SSR are briefly reviewed. To improve working conditions,

seed dressing tanks should be sealed hermetically and equipped with adequate filters to prevent emission fumes. A certain waiting time should be observed before work can be resumed on fields after the application of pesticides. The toxicological- hygienic characteristics of iodofenphos, a new pesticide, were studied.

78-2593. Lafornara, J. P. (US EPA, Edison, NJ) **Cleanup after spills of toxic substances.** *J. Water Pollut. Control Fed.* 50(4): 617-627; 1978. (7 references)

Efforts made by the Environmental Protection Agency (EPA) in responding to the more than 3000 spills of toxic chemicals, other than oil, which occur each year are described. Ongoing research and development efforts in the areas of spill prevention, detection, detoxification, and cleanup are discussed. A description of EPA's Hazardous Materials Spills Treatment Trailer is presented. This is a physical/chemical water treatment system. Several case histories of actual field operation of the trailer in response to toxic chemical spills are discussed. Some of these include spills of dinitrobutylphenol (dinoseb), polychlorinated biphenyls (PCB's), toxaphene, chlordane, Kepone (chlordecone), pentachlorophenol (PCP), and aromatic and chlorinated organics.

78-2594. Petrova, V. I.; Metlitskii, O. Z.; Triakhov, N. D. (Sci. Res. Inst. Hortic. Non-Chernozem Belt, USSR) **Deistvie di-trapeksa na mikroorganizmy pochvy pod zemlyanikoi. [Effect of di-trapex on soil microorganisms in strawberry patches.]** *Khim. Sel'sk. Khoz.* (5): 55-56; 1978. (6 references) (Russian)

The effect of Di-Trapex (Vorlex), used for soil fumigation at a rate of 500-1,000 l/ha, on soil microorganisms was studied. Di-Trapex had no depressing effect on the overall population of heterotrophic bacteria and bacteria requiring inorganic nitrogen. However, Di-Trapex caused a significant reduction in the populations of *Actinomycetes*, fungi (especially of the genera *Penicillium* and *Trichoderma*), cellulolytic microorganisms, and nitrifying and nitrogen-fixing bacteria. *Azotobacter* was most susceptible to Di-Trapex. The findings indicate that Di-Trapex caused major changes in the spectrum of the soil microflora.

78-2595. Vasil'eva, S. N.; Aleksandrova, T. G.; Rybakova, M. G.; Bryukhanov, V. A.; Bulavintseva, O. A.; Bulavintsev, A. G. (Med. Inst., Irkutsk, USSR) **Bytovoe otravlenie talliem. [Domestic poisoning with thallium.]** *Klin. Med. (Moscow)* 56(6): 130-132; 1978. (4 references) (Russian)

The case histories of 11 patients who accidentally consumed thallium are presented. All patients were seen with alopecia. Clinical manifestations of severe intoxication included polyradiculo myeloneuritis and organic dementia; the patients with mild intoxication were characterized by encephalopathy, and the patients with mild intoxication showed polyneuritis. Spectrographic examination revealed increased contents of thallium in urine and hair.

78-2596. Okonek, S. (II. Med. Klin. Poliklin. Univ., D-6500 Mainz, Germany) **Haemoperfusion mit beschichteter Aktivkohle zur Behandlung akuter Intoxikationen durch Arzneimittel, Pflanzenschutzmittel oder Pilze. II. Pflanzenschutzmittel. [Hemoperfusion with coated activated charcoal for treating acute intoxications by drugs, pesticides and fungi. II. Pesticides.]** *Med. Klin. (Munich)* 72(19): 862-866; 1977. (31 references) (German)

The elimination of the insecticidal alkyl phosphates E 605 forte (parathion), Metasystox R (demeton- *S*- methyl sulfoxide) and Roxion (dimethoate), and the bipyridilium herbicides Gramoxone (paraquat) and Reglone (diquat) from blood by hemoperfusion with coated activated charcoal is described. Hemoperfusion was performed by the Haemocol system (Dr. Fresenius KG, Bad Homburg.) The highly lipophilic nitrostigmine,(parathion) which cannot be removed by hemodialysis, is removed by hemoperfusion with clearance values around 60 ml/min. The hydrophilic Metasystox and Roxion can be removed by dialysis, but hemoperfusion yields higher clearance values (83.7 and 87.84 ml/min respectively.) Paraquat and diquat are not removed by hemodialysis at concentrations usually encountered in medical practice (200 to 1000 ng/ml), while hemoperfusion even at these low concentrations yields clearance values of approximately 60 ml/min. The method is useful only if applied a few hours after ingestion, before the poisons become bound to tissue.

78-2597. Taylor, J. R.; Selhorst, J. B.; Houff, S. A.; Martinez, A. J. (Dep. Neurol., Med. Coll. Va., Richmond, VA) **Chlordecone intoxication in man. I. Clinical observations.** *Neurology* 28(7): 626-630; 1978. (21 references)

The epidemiology of chlordecone exposure in workers resulting from industrial and environmental contamination, as well as symptoms of chlordecone intoxication are examined. Of the 148 employees at the chlorderone manufacturing plant in Hopewell, VA, 76 had a history of tremor after chlordecone exposure. All employees were found to have detectable levels of chlordecone in their blood; those with symptoms of intoxication had a mean level of 2530 ng/ml, while asymptomatic workers had a mean level of 600 ng/ml. Detectable levels of the insecticide were found in 94% of the workers' families and in 19% of the local residents; most of these were asymptomatic. Of the 23 employees with serum chlordecone levels of 2000 ng/ml or more, all had a history of tremor which appeared from 5 days to 8 mo after initial exposure to chlordecone. Fifteen employees had a disturbance in vision: headache, weight loss, irritability, and memory loss were also reported in workers with chronic chlordecone intoxication.

78-2598. Martinez, A. J.; Taylor, J. R.; Isaacs, E.; Dyck, P. J.; Houff, S. A. (Univ. Pittsburgh Sch. Med., Presbyterian-Univ. Hosp., Pittsburgh, PA) **Chlordecone intoxication in man. II. Ultrastructure of peripheral nerves and skeletal muscle.** *Neurology* 28(7): 631-635; 1978. (17 references)

Seventy-six out of 133 examined employees of a chemical plant in Hopewell, VA were thought to have

chlordecone poisoning, characterized by tremors, chest pain, weight loss, mental changes, arthralgia, skin rash, opsoclonus, muscle weakness, ataxia, incoordination, and slurred speech. Sural nerve and skeletal muscle biopsies were performed on 6 individuals, and they were found to have an increase in Reich and Elzholz bodies and endoneurial collagen. The number of unmyelinated fibers was decreased, and there was increased lipofuscin and lipidlike droplets in the subsarcolemmal areas of skeletal muscles. The results indicate that chlordecone affects Schwann cells and unmyelinated fibers of peripheral nerves.

78-2599. Whalen, R. P. (NY State Dep. Health, Albany, NY 12237) **Paraquat toxicity.** *NY State J. Med.* 78(8): 1308; 1978.

Available evidence suggests that pulmonary fibrosis might occur among long-term heavy users of marijuana which has been contaminated with small amounts of paraquat, as may respiratory irritation. In 1975 the Mexican government sprayed marijuana fields with paraquat. If the fields were then harvested, before significant sun exposure, the paraquat remained on dried leaves. About 60% of the marijuana used in the United States originates in Mexico. Human toxicity of paraquat is briefly described. It is noted that at the current levels of contamination, paraquat cannot be seen, tested, or smelled on the marijuana. No simple laboratory test is available for home use for its detection.

78-2600. Ushio, F.; Fukano, S.; Doguchi, M.; Abe, M. (Dep. Food Hyg. Nutr., Tokyo Metrop. Res. Lab. Public Health, Tokyo 160, Japan) **[Chlorinated hydrocarbons and pathological changes in wild ducks suffering from a mysterious disease.]** *Nippon Seitai Gakkaishi (Jpn. J. Ecol.)* 26(1): 13-18; 1976. (9 references) (Japanese)

Measurements were made of PCB and organochlorine pesticide residues in 18 wild ducks suffering from a disease which killed a great number of waterfowl in the metropolitan area of Tokyo. The disease was thought to be type C botulism. The major pathological changes were enlargement of the liver and hyperemia and/or atony in such organs as the small intestine, large intestine and rectum. Such changes were not detected in ducks caught by shotgun in the suburbs of Abashiri City, Hokkaido, which were used as controls. Levels of total BHC, total DDT and PCBs on a wet tissue basis in sick ducks were within the ranges of trace to 0.190 ppm, 0.004 to 0.930 ppm and 0.06 to 5.70 ppm, respectively. These were higher than in controls. The PCB and pesticide residues in sick ducks were too low to be held as directly involved in the causation of the disease.

78-2601. Najean, Y.; Pecking, A.; Le Mercier, N.; Zittoun, R.; Chaussade, R. (Serv. Cent. Med. Nucl., Hop. Saint-Louis, F 75475 Paris Cedex 10, France.) **Enquete etiologique sur l'aplasie medullaire. Incidence du sexe, de l'age, de la profession et de l'habitat chez 251 malades. [Etiological study of aplastic anemia: analysis of sex, age, profession and habitat in 251 patients.]** *Nouv. Presse Med.* 7(23): 2027-2030; 1978. (13 references) (French)

In the search for agents potentially responsible for aplastic anemia the sex, age, occupation and habitat of 251 patients suffering from the disease were analyzed. The study did not investigate the existence of a relationship of the disease to drug intake. Statistical analysis revealed a predominance in the population sample of males above the age of 20, a greater than proportional incidence after 50 years of age, and more frequent occurrence among the rural population as opposed to industrial workers. These results seem to minimize an etiological connection to industrial noxae and point in the direction of occupational hazards to which rural inhabitants are exposed, such as insecticides, pesticides, fertilizers, zoonoses, etc. This suspicion is reinforced by the circumstance that rural inhabitants are less likely to seek medical help from the university related medical centers which supplied the case histories for the study. The relatively low incidence among women seems to exonerate hair dyes.

78-2602. Kass, J. B.; Khamapirad, T.; Wagner, M. L. (Dep. Radiol., Baylor Coll. Med., Ben Taub Gen. Hosp., Texas Child. Hosp., Texas Med. Cent., Houston, TX.) **Pulmonary edema following skin absorption of organophosphate insecticide.** *Pediatr. Radiol.* 7(2): 113-114; 1978. (4 references)

A case of acute pulmonary edema in an 8-yr-old Mexican-American girl following exposure to organophosphate insecticide is presented. Symptoms included hypoxia, respiratory failure, and parasympathetic discharge. Exposure occurred when the girl rinsed her hair for five minutes with an agricultural organophosphate insecticide for treatment of an intractable infestation of lice. Treatment included 1.0 mg atropine and 0.5 grams Protopam (pralidoxime). Radiographic features included rapid onset of acute pulmonary edema without cardiomegaly followed by prompt clearing. It is noted that the clinical syndrome may manifest itself as soon as 5 min following contamination, but invariably appears within 24 hr. Therefore symptoms and radiographic evidence of pulmonary edema appearing after 24 hr hours generally cannot be attributed to organophosphate intoxication.

78-2603. Lebrun, P. (Sec. Ecol. Anim., B-1348 Louvain-la-Neuve, Belgium) **Incidences ecologiques des pesticides sur la faune du sol [Ecological effects of pesticides on soil fauna.]** *Pedologie* 27(1): 67-91; 1977. (31 references) (French)

The effects of herbicides and pesticides on the activity of the soil fauna, including its reducing and antiphotosynthetic function, mechanical fragmentation of plant debris, formation of humus, nitrogen fixation, and the stimulation and propagation of microflora are reviewed. While the tolerance of edaphic animals to pesticides is variable, for some taxa the levels of chemicals used in agriculture spell complete eradication. The effects also differ with the time of application of the chemicals in the cultivation cycle. The numerical reduc-

tion of the soil fauna ranges from 25% in the case of herbicides to 80% in the case of organochlorine and certain carbamate insecticides. A shift in the prevalence of organisms occurs, with harmful phytophages gaining the upper hand over saprophages. Resistance can develop and adaptation can occur, but they are often accompanied by the phenomenon of biomagnification. The effects of chemicals on the soil fauna stress the importance of soil testing for pesticide residues which, by way of their toxic effect on soil fauna, exert an adverse effect on soil fertility.

78-2604. Murphy, S. D. (Div. Toxicol., Dep. Pharmacol., Univ. Texas Med. Sch., Houston, TX) **Environmental toxicology: biological endpoints and other considerations in pollutant control policy.** *Radiat. Res.* 74(3): 459-460; 1978.

Laws passed during the past several years have made it necessary to expand the data available concerning the adverse biological effects of synthetic chemicals which may contaminate the environment. Major advances have been made in biological research which have expanded the nature and number of tests required for assessment of the potential toxic hazards of chemicals. The nature and application of biological test data necessary for pollutant control policy are affected by society and scientific perceptions of what constitutes a zero risk or acceptable risk level.

78-2605. Mossop, R. T. (PO Box ST 494, Southerton, Salisbury, Rhodesia) **Organophosphate poisoning.** *S. Afr. Med. J.* 54(6): 224; 1978.

This letter to the editor reviews patients poisoned with organophosphates during the past 10 years. In most cases there was found to be a history of occupational exposure, storage of foodstuffs in contaminated containers through ignorance, or suicide. A number of patients seen during 1977 were readmitted due to recurrence of symptoms after discharge, which contrasts with the usual findings of complete recovery if death had been avoided. Many of these patients had been wearing new clothing, acquired in odd circumstances, for a few hours before admission. Examination of this clothing revealed significant quantities of highly toxic organophosphates. Information is being sought to aid in the epidemiological study of these cases.

78-2606. Barthel, E. (Author address not given) **Lungenkrebs und Lungenfibrose beim beruflichen Umgang mit Pestiziden. [Lung cancer and pulmonary fibrosis due to occupational contact with pesticides.]** *Sitzungsber. Akad. Wiss. DDR Math. Naturwiss. Tech.* 2N: 33-45; 1978. (48 references) (German)

The literature indicates a relationship between exposure (experimental or occupational) to certain pesticides and development of lung cancer or fibrosis. Therefore observations were conducted on a group of 316 pest control officers and agronomists from the area of Neubrandenburg who had prolonged intermittent contact with various pesticides. A total of 30 malignant tumors were observed among this group; 11 of them were bronchial carcinoma. This represented an approximately 20-fold increase above the anticipated incidence for this group. Paraquat lung and vineyard sprayer's lung represent forms of pulmonary fibrosis reported in the literature as a consequence of pesticide exposure. A few cases of lung fibrosis were also reported in the literature as a result of using silicate-containing carrier materials in pesticide manufacture. In the present study the pulmonary fibroses observed following prolonged pesticide contact displayed two different morphological patterns: a silicosis-like pattern with nodular thickenings localized primarily in the lung periphery, and diffuse, striated lung alterations with signs of diffuse pulmonary emphysema. The latter type of lung change is most common. Fibrosis was attributed to prolonged exposure to multiple chemical irritants.

78-2607. Hepburn, H. R. (Author address not given) **Milk and honey.** *S. Afr. J. Sci.* 74(5): 160; 1978.

The value of insect pollination in feeding the world's peoples is noted. About 15% of the ground yielding crops for human consumption in the United States is grown in plants that rely on insect pollination, notably by honey bees. Pollination is also essential to the development of hybrids, which are important because of their vigor and resultant superiority to their parents. The turn away from the use of DDT and toward other chemicals resulted in the loss of about 60,000 honeybee hives in 1968 alone. The use and importance of honeybees for the larger field of agriculture must be recognized and protected.

78-2608. Hayes, M. M. M.; Van der Westhuizen, N. G.; Gelfand, M. (Dep. Histopathol., Univ. Rhodesia, Salisbury, Rhodesia) **Organophosphate poisoning in Rhodesia. A study of the clinical features and management of 105 patients.** *S. Afr. Med. J.* 54(6): 230-234; 1978. (17 references)

Patients who possibly had organophosphate poisoning and were treated at Harari Hospital during the period from January 1974 through November 1977 are described. The total number of patients was 105. Many of the cases were attempted suicides. The majority of patients demonstrated the classic clinical features of parasympathetic overactivity, but diagnosis was obscured in some by atypical presentations. Rapid diagnosis and utilization of treatment as outlined in this paper is thought to have reduced the mortality to less than 15%. In general treatment consists of removing the poison from the body, administration of atropine, and supportive measures.

78-2609. Zamotaev, I. P.; Berbentsova, A. P.; Rabukhina, N. A. (Cent. Clin. Hosp., Moscow, USSR) **Bytovye toksicheskie porazheniya legkikh. [Toxic pulmonary lesions due to household products.]** *Sov. Med.* (4): 88-92; 1978. (11 references) (Russian)

Potential hazards of household detergents and aerosol insecticides are discussed, and the case histories of

three patients who developed severe symptoms of toxic bronchitis, pseudomiliary interstitial pneumonia, hemorrhagic tracheobronchitis and hemorrhagic pneumonia are presented. Clinical and pathological changes of the lungs in the three cases are described.

78-2610. Vezina, M. (Dep. Med. Soc. Prev., Fac. Med., Univ. Laval, Quebec, Canada) **La sante publique via la sante au travail. [Public health via occupational health.]** *Union Med. Can.* 107(7): 650-656; 1978. (18 references) (French)

The methodological approach to the implementation of an occupational health program is discussed. In analogy to public health this methodological approach comprises 4 stages: analysis of the health problems of a given population; programming activities designed to improve the health of the population; coordinating the available and necessary community resources; and evaluating the effect of the measures adopted on the state of health of the chosen population. The first stage involves the use of epidemiological tools (using statistical evaluation of morbidity and mortality figures); measures adopted as the second stage will depend on the causative factors and will be decided on by competent specialists in the field. The coordination of resources involves a time-consuming multidisciplinary persuasion process by the medical authority on various ministries, official bodies, employers, etc. over whom it has no direct jurisdiction; finally, evaluation of a program involves the determination of the relationship between the results achieved and the effort and means invested. From a public health point of view the foremost objective of medical specialization in occupational health is the elimination of chemical, physical and biological risk factors in the environment.

78-2611. Bashkirov, G. G.; Fainberg, V. E. (All-Union Exped. Cont. Dis. Fish, Moscow, USSR) **Meropriyatiya po profilaktike otravlennykh ryb. [Measures against intoxication of fish.]** *Veterinariya (Moscow)* (4): 100-103; 1978. (Russian)

Data on the causes of mass poisonings and death of fish in water bodies of the USSR are presented. In 1976, the reported cases of fish poisoning and mortality were due to the discharge of industrial effluents (33%), agricultural effluents (32%), pesticides (15%), transportation wastes and petroleum products (2%), municipal wastewaters (1%) and other factors (17%). In view of the increasing production of pesticides, the risk of contamination of water bodies by such substances is increasing. In 1976, 724 specimens of fish were analyzed for residues of DDT, hexachlorane (BHC), 2,4-D and organophosphorus pesticides in the Latvian SSR.

78-2612. Fokina, K. V.; Bezuglyi, V. P. (Dept. Clin. Pathol. Chem. Etiol., All-Union Res. Inst. Hyg. Toxicol. Pestic., Polymers & Plastics, Kiev, USSR) **Rol' kompleksa khlori fosfororganicheskikh pestitsidov v razvitii ateroscleroza golovnogo mozga. [Role of combinations of organochlorine and organophosphorus pesticides in the development of cerebral atherosclerosis.]** *Vrach. Delo* (4): 19-23; 1978. (4 references) (Russian)

The potential role of a combination of organochlorine and organophosphorus pesticides in the pathogenesis of cerebral atherosclerosis was studied in a group of agricultural workers (predominantly women, aged 31-50 yr) who had occupational exposure to pesticides of >10 yr duration. The incidence of cerebral atherosclerosis was 26.9%, compared to 11.8% in a matched group who did not have occupational exposure to pesticides. The incidence of cerebral atherosclerosis was maximal. in the 51-60 yr age group (the incidence of disease in the 31-40-yr age group was 20%, compared to 4.8% in controls).

78-2613. Maj, S.; Zdziechowska, H.; Krzyzanowska-Wozniskowska, J. (Clin. Intern. Med., Inst. Hematol., Warsaw, Poland) **Analiza kliniczno-hematologiczna roznych postaci granulocytopenii. [Clinical-hematologic analysis of various forms of granulocytopenia.]** *Wiad. Lek.* 31(5): 317-321; 1978. (8 references) (Polish)

A clinical analysis was conducted on 50 cases of granulocytopenia observed over a 15-yr period at the Institute of Hematology in Warsaw. The ratio of females to males with the disease was 1.9:1; the average age of the patients was 49 yr. The most frequent causes were drugs (in women) and chemical agents (in men), as well as so-called hypersplenism. The principal chemicals implicated in causing granulocytopenia were insecticides and organic solvents. The mortality rate was 26% overall and 41% in the elderly; it was higher in men than in women. The results of treatment of severe cases were unsatisfactory.

See also 78-2509, *and* 78-2666.

78-2614. Bielecki, E. (Plant Breed. Stn. Gorka Narodowa, Krakow 31-222, Poland) **Further studies in the influence of phenyl mercury acetate on mitosis in *Allium cepa*.** *Acta Biol. Cracov. Ser. B* 20(1/2): 67-79 + plates; 1977. (21 references)

Root tips of *Allium cepa* were treated with 0.0001 to 0.4% aqueous solutions of phenyl mercury acetate (PMA) for 2 to 72 hr. Low concentrations after a short treatment showed a stimulating action, manifesting itself in an increase in the total number of mitoses and an increase in overall mitotic activity. The prolongation of treatment inhibited spindle action. High concentrations inhibited cytokinesis with 2 hr of treatment causing binucleate cells. Cells with two tetraploid nuclei were also noted. Prolongation of treatment with high concentrations had a mitodepressive action. C-mitosis occurred after 2 hr treatment at concentrations of 0.1% and upwards. Lethal changes such as stickiness and erosion of chromosomes increased in proportion to the increase of concentration and the time of treatment. Chromosome breaks were noted already after 2 hr treatment at 0.001 to 0.47% in metaphase as well as in prometaphase and prophase inside the nuclear membrane. This was intensified after treatment with stronger solutions and for longer periods of time.

78-2615. Balicka, N.; Krezel, Z. (Dep. Microbiol. Agric. Acad. Worclaw, Worclaw, Poland) **The effect of microorganisms on phytotoxicity of herbicides. Part V. Interaction of some microorganisms with betanal.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1/2): 61-65; 1977. (11 references)

Various forms of interaction between microorganisms and herbicides followed by changes in the phytotoxicity of the chemicals were studied. Betanal (phenmedipham) was used as the herbicide, and its interaction with epiphytic bacteria was studied. Changes in phytotoxicity of Betanal due to the presence of bacterial metabolites was dependent on the method of metabolite application. When the metabolites were introduced into plants through the roots before spraying with Betanal, the effect of the herbicide was reinforced. Foliar application of Betanal with bacterial metabolites caused no change in herbicide activity. Substances produced by bacteria render the plants more susceptible to the harmful effects of Betanal. It is suggested that this is the reason for the increase in herbicidal phytotoxicity.

78-2616. Nehez, M.; Paldy, A.; Selypes, A. (Inst. Public Health & Epidemiol., Med. Univ. Szeged, Szeged, Hungary) **Some data on the decomposition of dinitro-*o*-cresol by microorganisms.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1/2): 73-79; 1977. (25 references)

The decomposition of dinitro-*o*-cresol (DNOC) by bacterial organisms was examined. DNOC is the effective agent of the pesticide Krezonit E. Several bacteria were used in the study including *E. coli, P. vulgaris, B. cereus,* and *B. subtilis.* These bacteria had an effect on the decompositon of DNOC especially at 37°C, the optimal temperature for these particular bacteria. Whether or not these bacteria affect the toxicity of the pesticide during the decomposition was investigated. The findings indicate that during the microbiological decomposition of DNOC, toxic metabolites are not formed.

78-2617. Dobolyi, Cs.; Pasztor, Zs.; Kecskes, M. (Natl. Res. Inst. Hyg., Budapest, Hungary) **Xenobiotics and soil microbiota affected by xenobiotic interactions. III. 2,4-D-Na and the species composition of fungi in a chernozem.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1/2): 81-87; 1977. (16 references)

The decomposition of 2,4-D-Na and the fungal microflora affected by 2,4-D-Na and atrazine interactions in soil ecosystems were studied. In the presence of atrazine the decomposition rate of 2,4-D-Na was slower. In the first three wk the number of microscopic fungi decreased, but this number increased during the fourth week of incubation in chernozem with forest residue soil type at 50% of maximum water capacity and at 26 to 28°C. A decrease was noted in the occurrence of aspergilli and fungi having dark hyphae or some melanoid pigmentation organ when high doses of 2,4-D-Na and 2,4-D-Na plus atrazine were used. At the same time an increase was noted in penicillia and fungi having hyaline colonies. The last group involved a lot of yeasts with 211 fungal isolates belonging to 45 species of 30 general which were identified in the control soil.

78-2618. Bakalivanov, D.; Hlebarova, S. (N. Poushkarov Inst. Soil Sci., Sofia, Bulgaria) **Relationship between soil microflora and Afalon and Patoran herbicides under fertilizer application.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1/2): 101-108; 1977. (8 references)

The influence of afalon (linuron) and patoran (metobromuron) herbicides on soil microorganisms used in applications of 200 g ai/dka in field experiments with sunflowers on chernozem-smolnitsa was studied. During the study, fertilizer application was made in two levels: N-12 kg/dka, P-9 kg/dka, K-12 kg/dka, and N-24 kg/dka, P-24 kg/dka, K-24 kg/dka. From these studies it was concluded that carbamide herbicides afalon and patoran caused certain decreases in the quantity of soil bacteria, actinomyces and microscopic fungi in most of the analyses. Herbicidal activity was more clearly expressed at the beginning of treatment and usually stopped after the 90th day. Detoxication of these herbicides took place mainly until the 90th day after soil treatment. Fertilizer application weakened the inhibiting effect of herbicides on the soil microorganisms studied and also helped the speeding of their detoxication.

78-2619. Mehrle, P. M.; Mayer, F. L. (Fish Pestic. Res. Lab., Fish & Wildl. Serv., US Dep. Inter., Columbia, MO 65201) **Bone development and growth of fish as affected by toxaphene.** *Adv. Environ. Sci. Technol.* 8: 301-314; 1977. (20 references)

The effects of low concentrations of toxaphene on the growth and backbone development of brook trout, fathead minnows, and channel catfish are reported. Interference by toxaphene with vitamin C metabolism resulted in impairment

of collagen synthesis. Competition between structures of functions for vitamin C would have resulted in a functional deficiency of vitamin C. Whole-body residues of toxaphene in brook trout, channel catfish, and fathead minnows were in the range of those reported in fish by the National Pesticide Monitoring Program. Only the fish in the group exposed to the highest toxaphene concentration in the fathead minnow study were outside that range (0.5 to 48 μg/g). Brook trout, which were exposed at 9°C accumulated less toxaphene than the other two species which were exposed to 25 to 26°C. Although brook trout accumulated less toxaphene, they had a higher percentage of mortality during the exposure than did fathead minnows or channel catfish. However, the sublethal effects on bone composition and growth occurred at all concentrations in the brook trout and fathead minnow studies and the no effect concentration of toxaphene on growth and bone development was less than 39 and 94 ng/l for brook trout and fathead minnows, respectively. The no effect concentration for growth of channel catfish was between 129 and 299 ng/l and between 49 and 72 ng/l for bone composition.

78-2620. Kunc, F. (Microbiol. Inst. CSAV, Prague, Czechoslovakia) **Mikrobiologicke aspekty znecistovani pudniho prostredi pesticidy. [Microbiological aspects of the contamination of soil environment by pesticides.]** *Agrochemia* 18(6): 179-180; 1978. (Czech)

The relationship of microbiology to the contamination of soil by pesticides and the possibilities of microbiological abatement of potential damage are reviewed. On one hand pesticides affect soil microorganisms by inhibiting soil bacteria, actinomycetes, fungi and algae and by changing the antibiotic activity of actinomycetes and fungi especially in cases of repeated application and inadequate dispersion. On the other hand microbial metabolic changes can detoxify pesticides in 3 ways: by inoculating pesticides with specific microorganisms capable of transforming them; by inducing changes in the genetic apparatus of native soil microflora enabling it to metabolize some pesticides; and by suitably changing their characteristics (chemical structure, solubility etc.) to render them suitable for chemical degradation. The first approach holds little promise, the second offers some possibilities, as does the third approach. In addition, microbiology offers the possibility of alternative control of weeds and pests thus obviating the need to use chemicals for their control.

78-2621. DiPasquale, L. C.; Stevens, J. T.; Curley, A. (Author address not given) **Inhalation toxicology of pesticides (chapter 7).** In: *Air Pollution from Pesticides and Agricutural Processes.* Lee, R. E., Jr., ed. (Cleveland: CRC Press): pp. 177-215; 1976. (103 references)

Inhalation is the most complex route of administration of a pesticide used to evaluate its toxicology. This review covers design of the exposure chamber, types of chambers for pesticide studies, the generation of pesticide aerosols and vapors, and inhalation chamber analysis of pesticide atmospheres. One of the problems of inhalation toxicity testing is that the exact level of toxicant that an animal has received cannot be known. Inhalation toxicity testing includes acute inhalation hazard testing as well as subacute and chronic inhalation toxicity testing.

78-2622. Soderlund, D. M.; Casida, J. E. (Insectic. & Fungic. Dep., Rothamsted Exp. Stn., Hertfordshire AL5 2JQ, England) **Stereospecificity of pyrethroid metabolism in mammals.** *ACS Symp. Ser.* 42:173-185; 1977. (10 references)

The stereoselectivity in *in vitro* and *in vivo* mammalian metabolism of various isomers of resmethrin, permethrin, S-5439, and S-5602 is discussed. Metabolism rates of the optical antipodes of pyrethroids by mouse liver microsomal enzymes differ by at least 1.7-fold in the following cases: hydrolysis of [1R,*trans*]- vs [1S,*trans*]-resemethrin; hydrolysis of S(+)- vs R(-)-S-5439 and -S-5602; methyl hydroxylation of [1R,*trans*]- vs [1S,*trans*]-permethrin; methyl hydroxylation of S(+)- vs R(-)-S-5439; oxidation of S(+)- vs R(-)-S-5602; and hydrolysis and oxidation of αR- vs αS-R(-)-S-5602. Various degrees of stereospecificity are encountered with mouse and rat liver microsomal oxidases in the preferred methyl group for hydroxylation, i.e., *trans*(E) vs *cis*(Z) in the isobutenyl moiety of the four resmethrin isomers and 2-*trans* vs 2-*cis* in the four permethrin isomers. Stereospecificity in methyl hydroxylation of [1R]- and [1RS]- preparations of *trans*- and *cis*-permethrin is also evident with rats *in vivo*.

78-2623. Kociba, R. J.; Keyes, D. G.; Jersey, G. C.; Ballard, J. J.; Dittenber, D. A.; Quast, J. F.; Wade, C. E.; Humiston, C. G.; Schwetz, B. A. (Toxicol. Res. Lab., Health & Environ. Res., Dow Chem. USA, Midland, MI 48640) **Results of a two year chronic toxicity study with hexachlorobutadiene in rats.** *Am. Ind. Hyg. Assoc. J.* (38): 589-602; 1977. (10 references)

Male and female Sprague-Dawley rats were maintained for up to 2 yr on diets containing 0, 0.2, 2.0, or 20.0 mg/kg/day hexachlorobutadiene (HCBD) beginning at 7 wk of age. Ingestion of 20 mg/kg/day HCBD caused decreased body weight gain and survival, increased urinary excretion of coproporphyrin, increased kidney weight, increased renal tubular epithelial hyperplasia/proliferation, and renal tubular adenomas and adenocarcinomas, some of which metastasized to the lungs. Ingestion of 2 mg/kg/day caused lesser degrees of toxicity, with increased urinary coproporphyrin excretion and increased renal tubular epithelial hyperplasia/-proliferation but no neoplasms. No discernible ill effects were observed in rats given 0.2 mg/kg/day HCBD. The data indicate a clear-cut dose-response relationship for HCBD-induced toxicity, the kidney being the primary target organ. Neoplasms resulted only at dosage levels which caused significant tissue injury and other manifestations of toxicity.

78-2624. Snodgrass, H. L., Jr.; Weeks, M. H. (Toxicol. Div., US Army Environ. Hyg. Agency, Aberdeen Proving Ground, MD 21010) **Dermal penetration of three topical insect repellents in dogs and rabbits.** *Am. Ind. Hyg. Assoc. J.* 39(7): 540-545; 1978. (5 references)

Absorption of three insect repellents in dogs and rabbits was studied by radioactive monitoring of excreted urine daily for seven days following topical application. The repellents studied were cyclohexamethylene carbamide, *n*-butyl sulfonimido cyclohexa methylene, and 2-hydroxy methyl cyclohexane carboxylate. Significant percutaneous absorption of all three repellents occurred with in 24 hr. Cyclohexa methylene carbamide showed the greatest absorption. Measurable amounts of radioactivity persisted at the application site for both species after seven days.

78-2625. Bassett, D. J. P.; Fisher, A. B. (Dep. Physiol. Sch. Med., Univ. Pennsylvania Philadelphia, PA 19104) **Alterations of glucose metabolism during perfusion of rat lung with paraquat.** *Am. J. Physiol.* 234(6): E653-E659; 1978. (28 references)

To study the interaction of paraquat with glucose metabolism of isolated perfused rat lungs, and to compare the effects of paraquat with those previously observed on persusion with phenazine methosulfate, the lungs were ventilated with 5% carbon dioxide in air and perfused with bicarbonate buffer (pH 7.4) which contained albumin and 5.5 m*M* radiolabeled D-glucose. Lung glucose utilization was 44 μM /hr/g dry weight for controls, and 57 μM/hr/g dry weight during perfusion with 1.5 μM paraquat. Carbon dioxide production via the pentose cycle increased 182%, carbon dioxide production via mitochondrial metabolism increased 39%, and the rate of lactate production increased 28% during perfusion with paraquat. Therefore, paraquat generated an increased turnover of cytoplasmic NADPH and increased mitochondrial metabolism in its interaction with the lung.

78-2626. Noblet, G. P. (Dep. Entomol. Economic Zool., Clemson Univ., Clemson, SC 29631) **Tetrachlorvinphos as an ineffective feed additive in control of gastrointestinal nematodes of beef cattle.** *Am. J. Vet. Res.* 39(6): 1033-1036; 1978. (17 references)

The antihelmintic effect of tetrachlorvinphos given as a feed additive to beef cattle was evaluated. Thirteen Hereford heifers were given tetrachlorovinphos at a rate of 1.6 mg/kg/day for 29 wk; 12 similar heifers served as untreated controls. The data suggested that the level of parasitism, as estimated by the number of nematode eggs per g of feces, was not reduced by the addition of the pesticide to the mineral mixture of the medicate cattle. Results obtained from the identification and quantification of nematodes recovered at autopsy from six medicated and six nonmedicated heifers indicated that tetrachlorvinphos was ineffective as an antihelmintic against gastrointestinal nematodes of cattle.

78-2627. Palmer, J. S. (Dep. Vet. Toxicol., Sci. Educ. Adm., USDA, College Station TX 77840) **Toxicologic evaluation of microencapsulated formulation of diazinon applied dermally to cattle.** *Am. J. Vet. Res.* 39(7): 1231-1232; 1978. (9 references)

The toxicity of a new formulation of diazinon consisting of a 23% microencapsulated slurry was compared to that of the wettable powder formulation. Twenty-four newborn dairy calves (5 to 10 days old) and 12 two-year-old Angus steers were treated with differing concentrations of diazinon. The maximum dosage tolerated by calves was found to be 0.05% concentration for both the new formulation and the wettable powder. The steers tolerated dosages of .25% concentration. Cholinesterase activity was erratic and did not correlate well with the concentration applied. In calves, there was cholinesterase depression at 0.1% and in steers, at 2.0%. The new encapsulated formulation of diazinon should increase the effective residues and eliminate the need for repeated applications of the pesticides.

78-2628. Griffaton, G.; Lowy, R.; Ardouin, B.; Dupuy, F.; Plumas, B. (Lab. Nutr. Hum., Hop. Bichat, 75877 Paris Cedex 18, France) **Metabolisme energetique cellulaire chez des rats recevant un regime contamine par du lindane. [Cellular energy metabolism of rats on a diet contaminated by lindane.]** *Ann. Nutr. Alim.* 32(1): 111-128; 1978. (32 references) (French)

Three groups of rats were fed diet containing 60 or 240 ppm lindane. One day preceding the experiment all animals were fasted. Some animals from each group were forced to walk in a wheel for 18 hr, and some received a 2.6 g/kg glucose injection before they were killed, whereupon the redox and energy potentials of liver and muscle tissues were estimated via the determination of lactate, pyruvate, β-hydroxybutyrate, acetoacetate, ATP, ADP, AMP, inorganic phosphate, NADP and NADPH levels. Feeding 240 ppm lindane for 2 wk slowed down mitochondrial activity in the liver and increased ketogenesis by inhibiting the Krebs cycle. Administration of glucose ip suppressed this ketogenesis, but the glucose supplied was less efficiently converted to energy by the contaminated rats. During the forced muscular exercise mitochondrial function in control animals was the same as at rest. In rats fed lindane the exercise slowed down the carboxylic acid cycle and thereby neoglucogenesis as well. From the energy supply viewpoint lindane intake has consequences similar to those induced by equivalent quantities of dithiocarbamates: the latter, by inhibiting microsomal enzymes, inhibit phosphorylation, while lindane as an inducer of microsomal enzymes reduces Krebs cycle activity. The 60 ppm lindane level had no effect on the above parameters.

78-2629. Poitou, P.; Gradiski, D. (Lab. Toxicol., INRS, 54500 Vandoeuvre, France) **Interet des methodes psychopharmacologiques dans l'etude toxicologique experimentale des substances industrielles. [Importance of psychopharmacological methods in the experimental toxicological study of industrial substances.]** *Arch. Mal. Prof. Med. Trav. Secur. Soc.* 39(3): 163-169; 1978. (17 references) (French)

Some simple and reproducible psychopharmacological methods used in behavioral toxicology to assess the potential noxious effects of chemical substances resulting from the sensitivity of the CNS to poisons are reviewed. These methods may be used to shed light on the difference between the

maximum permissible levels of various substances promulgated by the U.S. and the USSR (in a list of 151 substances 136 U.S. values are higher than the corresponding USSR values). This is due to the fact that the Russian levels are largely based on results obtained by behavioral methods measuring conditioned reflexes. The subjectivity of psychophysiological tests performed on humans is eliminated by performing behavioral studies on animals. The rotarod test will reliably indicate even subacute toxicity of a substance via the criterion of impaired physical integrity. Several types of manual and automatic open field observation tests measuring spontaneous activity are likewise useful. Other methods are designed to measure avoidance responses to a disagreeable stimulus. Finally there are electrophysiological methods for measuring behavioral change, but these methods are not generally usable because they require specialized equipment. DDT is cited as causing anxiety and excitation.

78-2630. Langel, U.; Jary, J. (Dep. Org. Chem., Tartu State Univ., Tartu 202400, USSR) **Leaving group effects in butyrylcholinesterase reaction with organophosphorus inhibitors.** *Biochim. Biophys. Acta* 525(1): 122-133; 1978. (34 references)

The kinetic constants k_2 *KQ* and the second-order rate constant *i* of butylrylcholinesterase (acylcholine acylhydrolase, EC 3.1.1.8) inhibition by organophosphorus compounds $(C_2H_5O)_2P(O)SX$, with both ionic and non-ionic substituents X, were determined at 25°C and pH 7.5 in 0.15 *M* KCl. The data were analyzed in terms of structure-activity relationships, and the roles of the leaving group inductive effect and hydrophobicity in the enzyme specificity were established. This made possible calculations of the actual contribution of the substituent ionic charge in the effectiveness of butyrylcholinesterase action. On the basis of the structure-activity relationships for butyrylcholinesterase and acetylcholinesterase the specificities of the enzymes are compared and some common features are discussed. (Author abstract by permission)

78-2631. Daubner, I.; Toth, D.; Jezova, E.; Tomasovicova, D. (Inst. Exp. Biol. Ecol. Slovenian Acad. Sci., 88534 Bratislava, Czechoslovakia) **Vplyv pesticidov na mikrobalnu aktivity vo vode. [Effects of pesticides on microbial activity in water.]** *Biologia (Bratislava)* 33(6): 497-505; 1978. (8 references) (Slovene)

The effects of 6 pesticides were investigated on some of the physiological characteristics of representatives of the autochthonous (*P. fluorescens, T. pyriformis*) and allochthonous (*E. coli*) water microflora. The pesticides tested, at concentrations reflecting those which may occur in surface waters (average 1.8 μg/l), did not exert negative effects on the microorganismsm present. The microbes were able to utilize some of the pesticides (lindane, benomyl) as nutrients. Higher concentrations (50-100 μg/ml) of the pesticides investigated, especially dithane (zineb), but also orthophaltan (difolatan), topsin (thiophanate) and Sulikol, inhibited multiplication, respiratory and dehydrogenase activity of microorganisms. Protozoa (*Tetrahymena pyriformis*) were the most sensitive of the test organisms employed; *Pseudomonas fluorescens*, the typical representative of water microflora, was least sensitive.

78-2632. Toth, D.; Tomasovicova, D. (Inst. Exp. Biol. Ecol., Slovenian Acad. Sci., 88534 Bratislava, Czechoslovakia) **Vplyv povrchovej vody a fungicidnych latok na prezivanie buniek *Sporocytophaga cauliformis*. [Effect of surface water and fungicides on survival of *Sporocytophaga cauliformis* cells.]** *Biologia (Bratislava)* 33(6): 507-513; 1978. (6 references) (Slovene)

The survival of *Sporocytophaga cauliformis*, part of the autochthonous water microflora, was investigated in surface water from the Danube. Following incubation for 2 wk with Danube water the number of *S. cauliformis* individuals capable of multiplication decreased by only about 20%. Morphological changes caused in *S. cauliformis* cells by benomyl, dithane (zineb), orthophaltan (difolatan), and Topsin (thiophanate) were investigated. Only dithane and orthophaltan greatly inhibited colony formation on a solid culture medium, modified Moulton agar. The presence of fungicides accelerates the process of cell transformation from vegetative forms into microcysts.

78-2633. Sawicki, J. (Dep. Food Sci., Inst. Biopharm., Acad. Med., Warsaw, Poland) **Dzialanie antycholinoesterazowe i dealkilacja jako czynniki warunkujace toksycznosc bromfenwinfosu i polfosu. Cz. II. Dzialanie antycholinoesterazowi i metabolizm bromfenwinfosu i polfosu u szczura. [Cholinesterase inhibitory action and dealkylation as causative factors in toxicity of bromfenvinfos and polfos. Part II. Cholinesterase inhibitory action and metabolism of bromfenvinfos and polfos in rats.]** *Bromatol. Chem. Toksykol.* 10(3): 235-241; 1977. (34 references) (Polish)

Two ^{14}C-labeled insecticides, bromfenvinfos and polfos (methyl analog of bromfenvinphos), both of the organophosphorus group of pesticides, were administered to rats. After 1, 4, and 24 hours blood serum acylcholine acyl-hydrolase (ChE) and brain acetylcholine acetyl-hydrolase (AChE) activities were measured, along with measurements of radioactivity in the tissues. Serum and brain radioactivities with both labeled preparations were the same at 1 and 4 hr, but bromfenvinfos appeared to be a much stronger inhibitor of AChE and ChE. About 22% of the serum radioactivity occurring as early as 1 hr after administration was due to metabolic products of polfos and only about 6% to those arising from bromfenvinfos. The differential toxicity of the insecticides resulted first and foremost from the difference in dealkylation rates of these compounds rather than from their differentiated cholinesterase inhibitory activity.

78-2634. Folmar, L. C. (Fish-Pestic. Res. Lab., US Fish & Wildl. Serv. Denver Fed. Cent., Denver, CO 80225) **Avoidance chamber responses of mayfly nymphs exposed to eight herbicides.** *Bull. Environ. Contam. Toxicol.* 19(3): 312-318; 1978. (4 references)

The avoidance reactions of mayfly nymphs exposed to eight herbicides were investigated. The herbicides included copper sulfate, 2,4-DMA (dimethylamine salt of 2,4-D), Aquathol K (endothall), dalapon, Roundup (glyphosate), diquat, xylene, and acrolein. Mayfly nymphs avoided the highest test concentrations of copper sulfate, diquat, and Roundup, but did not avoid the other herbicides at the experimental concentrations tested. No avoidance of 2,4-D DMA was noted at 10 mg/l. At 100 mg/l no avoidance was noted, but a 70% mortality ensued. No avoidance was noted for any chemical present at or below concentrations that might be expected in receiving waters or return flows after a normal application at recommended rates. With the exception of diquat and Aquathol K, the mayfly nymphs appeared less sensitive to the eight chemicals than did the rainbow trout fry previously tested. The relatively low avoidance sensitivity of mayflies to these herbicides suggests that concentrations expected in irrigation return flows should not cause avoidance or otherwise dislodge benthic insects from their habitats in natural receiving streams. However, the inability of mayflies to perceive and avoid various concentrations of a herbicide could be detrimental, for they may receive a lethal exposure before attempting to avoid the chemical.

78-2635. Davies, D. B.; Holub, B. J. (Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Determination of the 'no effect' level of dietary parathion for the rat based on a short-term study.** *Can. J. Physiol. Pharmacol.* 56(4): 659-664; 1978. (22 references)

Adult female rats (220-260 g) were fed a semipurified diet to which the pesticide parathion was added. Dietary concentrations of parathion studied ranged between 0.5 and 20 ppm. At designated times following the initiation of treatment, control and treated animals were sacrificed for biochemical assessment. Routine investigations encompassed the determination of plasma cholinesterase activity using a highly sensitive radiometric assay. General nutritional evaluations included measurement of body weights and feed consumption during the growing period. In all studies, feeding parathion at the levels used produced no visible toxic manifestations. Final body weights and feed consumption of treated rats were comparable with control values in most cases. Data obtained from feeding trials of 1-25 days in duration indicated that reduction of plasma cholinesterase activity was most pronounced following 9-11 days of dietary parathion treatment (8 ppm). Feeding parathion at levels of 3.0 ppm or less for 11 days was without effect on plasma cholinesterase activity. Accordingly, the 'no effect' level of parathion for the female rat was judged to be 0.21 mg/kg body weight per day based on this short-term study. Using a safety factor of 100, this 'no effect' level translates into an 'acceptable daily intake' for humans of 2.1 μg parathion/kg body weight per day, which greatly exceeds levels reported to be ingested by Canadians. (Author abstract by permission)

78-2636. Miallis, J. B.; Thomas, V. M.; Gray, R. A.; Murphy, J. J.; Hollingworth, R. M. (Mountain View Res. Cent., Stauffer Chem. Co., Mountain View, CA) **Metabolism of R-25788 (*N,N*-diallyl- 2,2-dichloro acetamide) in corn plants, rats and soils.** In: *Chemistry and Action of Herbicide Antidotes.* Pallos, F. M., Casida, J. E., eds. (New York: Academic Press) pp. 109-131; 1978. (8 references)

Injury to corn by thiocarbamates can be prevented by R-25788. Metabolism and environmental studies using the ^{14}C-labeled compound showed that 4 days after a single oral dose to rats, the rat urine, feces, expired carbon dioxide and tissue residues accounted for 73%, 13%, 5%, and 6%, respectively of the administered chemical. Six percent of the absorbed radioactivity was liberated by corn seedlings as carbon dioxide in a ten day study. Major metabolites in both rats and corn were formed by dechlorination and oxidation of the antidote. In corn seedlings unchanged R-25788 was identified, and it was also found in rat urine, although in both cases it accounted for only minor amounts of the total radiocarbon recovered. In 21 days 26% of the radioactivity was liberated from soil. The major products remaining in the soil were R-25788 along with at least 7 minor metabolites. Three of the non-polar metabolites were *N*-allyl- 2,2-dichloro acetamide, *N,N*-diallyl- 2-chloro acetamide, and *N,N*-diallyl acetamide.

78-2637. Shimabukuro, R. H.; Lamoureux, G. L.; Frear, D. S. (Metab. & Radiat. Res. Lab., ARS, USDA, Fargo, ND) **Glutathione conjugation: A mechanism for herbicide detoxication and selectivity in plants.** In: *Chemistry and Action of Herbicide Antidotes.* Pallos, F. M., Casida, J. E., eds. (New York: Academic Press): pp. 133-149; 1978. (32 references)

Glutathione conjugation of herbicides in plants is reviewed, and the significance of this reaction in herbicide detoxication and selectivity is discussed. Glutathione conjugation appears to be a common reaction in both plants and mammals. The terminal product in plants, however, is not the mercapturic acid which is formed in mammals. The terminal product of glutathione conjugation in plants is formed through a detoxication mechanism which reduces the active internal concentration of the herbicide and prevents irreversible injury. The importance of this conjugation reaction in plants is significant in that it detoxifies the herbicide and plays a part in its selectivity.

78-2638. Lay, M. M.; Casida, J. E. (Univ. California, Berkeley, CA) **Involvement of glutathione and glutathione *S*-transferases in the action of dichloroacetamide antidotes for thiocarbamate herbicides.** In: *Chemistry and Action of Herbicide Antidotes.* Pallos, F. M., Casida, J. E., eds. (New York: Academic Press): pp. 151-160; 1978. (20 references)

Herbicide antidotes provide an opportunity to extend the use of a specific herbicide or class of herbicides to new areas of crop production. The antidote minimizes or prevents crop injury without adversely affecting herbicidal potency. The reactions involved in the protection of corn by R-25788 to injury from EPTC (eptam) are reviewed. It is suggested that the herbicide antidote R-25788 temporarily raises corn glutathione content and glutathione *S*-transferase activity,

thereby facilitating EPTC sulfoxide metabolism by carbamoylation of glutathione. This mode of action would probably be applicable to other thiocarbamates and their sulfoxides and to antidotes related to R-25788. It is not clear by what mechanism R-25788 increases corn glutathione content and glutathione *S*-transferase activity.

78-2639. Collet, G. F.; Pont, V. (Stn. Fed. Rech. Agron. Changins, CH-1260 Nyon, Switzerland) **Le role de la cysteine dans la detoxification d'un herbicide. [The role of cysteine in the detoxification of a herbicide.]** *C. R. Acad. Sci. Ser. D* 286(9): 681-4; 1978. (7 references) (French)

The physiological neutralization of the active substance of a herbicide through metabolic transformations in the plant is demonstrated based on the example of the condensation of the hydrolysate of the herbicide Bidisin (chlorfenprop-methyl) with the sulfur-containing amino acid cysteine in the wheat coleoptile test, designed to measure growth inhibition. Comparison of the degree of growth inhibition induced by different concentrations of ^{14}C-Bidisin exhibited by coleoptiles via the distribution of radioactivity between the aqueous and ether extracts revealed the existence of an inverse relationship between phase distribution and the decay of the tissues. Chromatogrpahic analysis revealed that the ether phase contained practically no Bidisin, irrespective of the initial concentration. This physiological neutralization is more efficient than the catabolism yielding benzoic acid derivatives.

78-2640. Sapis-Domercq, S.; Bertrand, A.; Mur, F.; Sarre, C. (Stn. Agron. Oenol. Bordeaux, Inst. Oenol. Univ. Bordeaux II, 33405 Talence, France) **Influence des produits de traitement de la vigne sur la microflore levurienne. Experimentation 1976. [Effects of fungicide residues from grapevines on fermentating microflora. 1976 experiments.]** *Connaiss. Vigne Vin* 1(3): 227-242; 1977. (5 references) (French)

Must from grapevines treated with the fungicides Vinchlozoline and Rovral was fermented. Eleven samples were taken at 2 or 3 day intervals up to the 25th day and examined following seminanaerobic incubation to determine what effect, if any, the residual fungicides had on malolactic fermentation. The variation in the bacterial population was evaluated in comparison with untreated, fermented samples. On the 25th day the carbon dioxide developed in each sample bottle was weighed; the fermentation products were determined by chemical analysis and the volatile compounds by gas chromatography. The residues had no deleterious effect on the grape microflora nor on the course of alcoholic fermentation (as measured by the number of colonies and strains of *Hauseniaspora uvarum*). Samples from grapevines treated with Vinchozoline exhibited a higher proportion of *Saccharomyces bayanus* in the microflora (other strains present: *S. cerevisiae, S. chevalieri, S. italicus*) than untreated samples or those treated with Rovral. This result is in agreement with the results obtained during the preceding year in an identical experiment under different climatic conditions.

78-2641. Chen, K. C. (Univ. Kentucky, Lexington, KY) **The significance of glutathione conjugation in the bioalteration of naphthalene, 2,4-dinitrobromobenzene and 1-naphthyl *N*-methylcarbamate (carbaryl) in rats.** *Diss. Abstr. Int. B* 38(2): 620-621; 1977.

Glutathione (GSH) conjugation in rats was investigated *in vitro* and *in vivo* using ^{14}C-labeled carbaryl, naphthalene and 2,4-dinitrobromobenzene (2,4-DNBB). Following incubation of carbaryl with 15,000 *g* supernatant of a rat liver homogenate fortified with NADPH and GSH the carbaryl was metabolized, but the amount of conjugates formed was not dependent on the glutathione concentration. Four water-soluble metabolites were formed, but it was concluded that glutathione conjugation did not occur with carbaryl or with 1-naphthol. Following ip injection of naphthalene-1-^{14}C, 1-naphthyl- 1-^{14}C-carbaryl, and 2,4-DNBB-^{14}C to rats 50%, 80% and 68% of the radioactivity was excreted in the urine in 72 hr. In contrast to naphthalene, mercapturic acid derivatives were not evident in the urine of carbaryl treated animals. Glucuronic acid and sulfate conjugates were the predominant types of metabolites found in the urine of rats dosed with carbaryl. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 77-15,938)

78-2642. Sklyarov, A. L. (I. M. Sechenov Inst. Evolut. Physiol. & Biochem., Leningrad, USSR) **Deistvie fosfororganicheskikh ingibitorov kholinesteraz GD-7 i GD-42 na sinapticheskie potentsialy portnayazhnoi myshtsy lyagushki. [Effect of the organophosphorus cholinesterase inhibitors GD-7 and GD-42 on synaptic potentials of frog musculus sartorius.]** *Dokl. Akad. Nauk SSSR* 234(1): 242-245; 1977. (10 references) (Russian)

The effect of the organophosphorus cholinesterase inhibitors GD-7 (O-ethyl- S-β- mercaptoethyl ester of methylphosphonic acid) and GD-42 (the methylsulfomethylate analog) on synaptic potentials was studied in the frog sartorius muscle - ischiadic nerve system (the microelectrode technique used is described elsewhere). Both GD-7 at 0.2 μM and GD-42 at 0.2 μM failed to affect the parameters of the end plate potentials (EPP); GD-7 at 2 μM and GD-42 at 2 μM increased the amplitude and duration of EPP, probably due to inhibition of synaptic cholinesterases. Both GD-7 and GD-42 caused irreversible inhibition of postsynaptic membrane at 20 μM.

78-2643. Pavlova, M.; Popov, Ch. S.; Ivanov, N. (Higher Inst. Zootech. Vet. Med., 6000 Stara Zagora, Bulgaria) **Effect on diet on changes in the activity of some enzymes located in the endoplasmic reticulum, caused by chemical agents.** *Dokl. Bolg. Akad. Nauk* 31(1): 101-104; 1978. (11 references)

The effect of different diets on the activities of certain microsomal enzymes was studied. The simulatory action of DDT and phenobarbital on these enzymes was also tested. Rats on one diet were fed caseins 15%, corn starch 40%, sucrose 26%, mineral mixture 4%, dried baker's yeast 5%, olive oil 10%, and adequate amounts of vitamins A, D2 and

E. Group II received the same feed with gelatin substituted for casein. Group III animals were fed a diet without minerals. Group IV animals were given 20% heated olive oil in place of the normal olive oil. Group V animals received oats, bread and yogurt. When the animals were fed differently, the enzymes studied did not show similar changes. The most important change was in the activity of the metabolic pathway responsible for lipid peroxidation. It was slightly activated in liver homogenates from rats fed on a diet containing gelatin instead of casein and was inhibited by 14% after feed deficient in minerals and by 53% in the case of the animals given heated oil.

78-2644. Perfect, T. J.; Cook, A. G.; Critchley, B. R.; Critchley, U.; Moore, R. L.; Russel-Smith, A.; Swift, M. J.; Yendon, R. (Int. Inst. Trop. Agric., Ibadan, Nigeria) **The effects of DDT on the populations of soil organisms and the processes of decomposition in a cultivated soil in Nigeria.** *Ecol. Bull. (Stockholm)* 25: 565-568; 1977.

The results of a project designed to investigate the effects of DDT on the population of animals and microorganisms and plant litter decomposition in cultivated soil, as well as the assessment of possible relationships between prolonged use of DDT and the maintenance of soil fertility under continuous cropping is reported. Pesticide studies showed that initial DDT concentration in the 0-300 mm horizon of the soil was high, but became smaller as plant cover increased. DDT absorbed by the roots was shown to be translocated to aerial parts of the plant. Sampling of surface and subterranean soil fauna following cultivation showed that cultivation decreased the populations of all groups and the new population was comprised of species better adapted to the cultivated habitat. Decomposition studies showed that DDT does not directly affect the microbial component of decomposition. Evidence shows that there may be a relationship between prolonged use of DDT and decline in crop yield.

78-2645. Korde, B. A.; Kokina, I. Ya.; Galkovskaya, G. A.; Eremova, N. G. (Inst. Biology, Acad. Sci. Latvian SSR, Riga, USSR) **Vliyanie gerbitsida 2,4-D-Na na intensivnost' obmena u *Daphnia magna* v embriogeneze i postembrional'nom periode. [Effect of herbicide sodium salt of 2,4-D on the metabolic rate of *Daphnia magna* during embryogenesis and postembryonic period.]** *Eksp. Vodn. Toksikol.* 6: 125-131; 1976. (9 references) (Russian)

The toxicity of sodium salt of 2,4-D was studied in crayfish *Daphnia magna.* Intensity of metabolism was measured for five stages of development of *D. magna* (3 embryonal stages and 2 postembryonal stages), at different temperatures (10°C and 20°C) and at different concentrations of 2,4-D-Na (7.5 m*M* and 15m*M*). Exposure to the herbicide caused mild inhibition of oxygen consumption in 3rd embryonal stage, significant inhibition of oxygen consumption in 8th embryonal stage, and maximum inhibition of oxygen consumption in 2nd juvenile stage. The degree of inhibition was temperature- and dose-independent.

78-2646. Kokuricheva, M. P. (State Sci. Res. Inst. Lake & River Fish., Leningrad, USSR) **O patomorfologicheskikh izmenenniyakh u ryb pri deistvii razlichnykh kontsentratsii diurona. [Pathomorphological changes in fish under the effect of different concentrations of diuron.]** *Eksp. Vodn. Toksikol.* 6: 172-177; 1976. (9 references) (Russian)

The effect of diuron on morphological changes of various organs of trout yearlings was studied in acute, subacute and chronic poisoning tests. The concentrations in water were 16 and 21 mg/l in the acute tests (3-4 days), 0.0625-8 mg/l in the subacute tests (20 days), and 0.03125-1 mg/l in the chronic tests. The fish exposed to 16 and 32 mg/l concentrations died in 3-4 days. All concentrations, including the lowest, had toxic effects on the animals, which were manifested as hyperemia and dystrophic changes of the parenchymatous organs and brain cells, focal nonreactive necrosis of the liver, desquamation of the cells of the convoluted tubules of the kidneys, as well as dystrophy and necrobiosis of the bronchial epithelium.

78-2647. Freimane, T.; Grundule, M. (Inst. Biol., Acad. Sci. Latvian SSR., Riga, USSR) **Kolichestvennye sdvigi lipidnykh fraktsii v organizme karpa pod vozdeistviem lindana i DDT. [Quantitative changes of lipid fractions in carp organisms under the influence of lindane and DDT.]** *Esksp. Vodn. Toksikol.* 6: 248-254; 1976. (8 references) (Russian)

Lipid fractions of blood plasma, liver, myocardium and carp brain were studied to determine the effects of DDT (0.1 mg/l) and lindane (1 and 0.1 mg/l). DDT increased the amount of phospholipids, free cholesterol and non-esterified fatty acids in the liver. Phospholipids in the spleen increased also. The quantity of free cholesterol and non-esterified fatty acids decreased in the brain. At the 0.1 mg/lg level lindane increased the amount of phospholipids in the liver, but that of non-esterified fatty acids was decreased. At 1 mg/l lindane the level of phospholipids, free cholesterol, and cholesterol esters considerably decreased in blood plasma, but the level of non-esterified fatty acids increased markedly. In myocardium the level of free cholesterol and cholesterol esters fell. The amount of phospholipids and free cholesterol decreased in the spleen, and the quantity of cholesterol esters in the spleen and brain were considerably increased.

78-2648. Short, R. D.; Minor, J. L.; Unger, T. M.; Lee, C. C. (Midwest Res. Inst., Kansas City, MO 64110) **Teratology of Guthion.** *EPA Final Draft Report No. 1:* 21 p.; 1978. (5 references)

Teratogenic potential of Guthion (azinphos-methyl), a pesticide with anticholinesterase activity, was investigated. The first phase of the program involved a toxicity study treating virgin female rats and mice with Guthion. During the second phase of the study pregnant rats and mice were treated during gestation with Guthion and their fetuses were examined for abnormalities. In addition, some pregnant rats were treated during gestation and lactation and their pups were observed until weaning. Doses of 0, 1.25, 2.5, and 5.9 mg/kg/day were selected for the developmental study. The

high dose affected maternal welfare only in rats. Guthion did not significantly increase in a dose-related manner any of the specific anomalies noted in either rats or mice. Dams in the high dose group were more sensitive to Guthion later in gestation with the result that deaths and signs of anticholinesterase toxicity increased during this time. Guthion also adversely affected maternal welfare in this group. As a result of Guthion toxicity, only one litter survived until weaning. The inability to dissociate toxicity in adult and developing animals suggests that Guthion has little primary effect on the development of rats and mice.

78-2649. Wolthuis, O. L.; Kepner, L. A. (Med. Biol. Lab., TNO, 2280 AA Rijswijk, The Netherlands) **Successful oxime therapy one hour after soman intoxication in the rat.** *Eur. J. Pharmacol.* 49(4): 415-425; 1978. (21 references)

The restoration of soman-induced inhibition of neuromuscular junction was studied in intact rats treated with the bis quaternary mono oxime HS-6. Attempts were made to determine if the functional recovery resulted from increased levels of AChE or whether nonenzymatic processes were involved. Both HS-6 and HI-6 appeared to be good reactivators of the inhibited enzyme when administered shortly after soman and before significant ageing of the phosphorylated cholinesterase occurs. HI-6 proved to be more effective in this regard than did HS-6. Functional recovery did not result from a direct pharmacological effect of HI-6. The only feasible explanation at present is that the ageing process is retarded *in vivo*. Since only a small increase in cholinesterase activity was noted together with a considerable recovery in neuromuscular function, and there was no sharply localized reactivation at the endplate, it was suggested that only a very small fraction of the normal cholinesterase activity was required to sustain breathing.

78-2650. Roux, F.; Bescol-Liversac, J.; Guillam, C.; Fournier, Et. (INSERM, Unite Rech. Toxicol. Exp., Hop. Fernand-Widal, Paris Cedex 10, France) **Etude de l'action toxique du lindane. Modifications biochiniques et ultrastructurales du systeme lysosomial dans l'hepatocyte en culture. [Study of the toxic action of lindane. Biochemical and ultrastructural changes of the lysosomal system in hepatocyte cultures.]** *Eur. J. Toxicol. Environ. Hyg.* 9(6): 357-371; 1977. (28 references) (French)

The effect of three concentrations of lindane (1-25 μM, over 15 μM, over 150 μM) on the growth of cultured fetal chicken liver cells (exposure upto 40 hr) and on their lysosomal system (by the determination of acid phosphatase activity in the homogenate and the soluble extra lysosomic fraction, by microscopy and electron microscopy) was studied on the premise that growth inhibition is a criterion of toxicity and that lysosomes participate in the defense mechanism of the cell by autophagocytosis. Below 25 μM, cell growth was unaffected, acid phosphatase activity decreased, and the absence of a reaction of the Golgi saccules is interpreted as the result of reduced synthesis of the lysosomal enzyme. Concentrations exceeding 25 μM slowed down cell growth and slightly enhanced acid phosphatase activity. Concentrations in excess of 150 μM resulted in the presence of the enzyme in vacuoles with a heterogeneous content, and in increased acid phosphatase activity in the soluble extralysosomal fraction indicating the development of autophagocytosis.

78-2651. Kulik, M. I. (Inst. Molec. Biol. & Genet., Kiev, USSR) **Izuchenie mutagennoi aktivnosti tsineba. [Analysis of mutagenic activity of zineb.]** In: *Geneticheskie Posledstviya Zagryazneniya Okruzhayushchei Sredy.* Dubinin, N. P., ed. (Moscow: Nauka): pp. 177-179; 1977. (Russian)

Potential mutagenic activity of fungicide zineb (zinc salt of ethylene-bis- dithiocarbomine acid) was studied on flint wheat. Treatment of dry seeds with zineb suspension (0.2-1.6% solution, for 16 hr) significantly increased the incidence of chromosome aberrations in rootlets (from 2.46% at 0.2%-solution to 3.97% at 1.6%-solution, vs. 1.0% in controls).

78-2652. Matveeva, V. G. (Inst. Genet. & Cytol., Sib. Branch, USSR Acad. Sci., Novosibirsk, USSR) **Mutagennaja aktivnost' pestitsida DDB v somaticheskikh i generativnykh kletkakh myshei. [Mutagenic activity of the pesticide DDB in somatic and in regenerative murine cells.]** In: *Geneticheskie Posledstviya Zagryaznenniya Okruzhayushehei Sredy.* Dobinin, N. P., ed. (Moscow: Nauka): pp. 160-166; 1977. (8 references) (Russian)

The mutagenic activity of DDB (consisting of composite vat residues from methallyl chloride manufacture, primarily dichloro isobentylene and isobutylene) on bone marrow and germ cells of male C57Bl mice was studied. Significant increase was observed in the frequency of anaphases and telophases with chromosome rearrangements in the bone marrow following the intragastric and intraperitoneal administration of a single 100 mg/kg dose (0.2 of LD50). The induced rearrangements were mainly chromatid bridges with solitary fragments. The frequency of bone marrow cells with aberrant chromosomes increased gradually to 10% versus 4.1% in the controls by the 15th day of the subacute experiment in which the animals received DDB in daily doses of 10 mg/kg for 20 days. The frequency of the aberrations returned to the background level in 10 days after the treatment. In the 8-mo chronic experiment, the daily doses of 6 and 1.2 mg/kg induced chromosome aberrations in 6.5% and 6.7% of the cells, respectively, versus 4.3% in controls. Treatment with 100 mg/kg caused an increase in the frequency of chromosome damage from 5.6% to 15.2% in the diplonema prophase. One fifth of the damages were asymmetrical translocations, one third acentric fragments, the rest being somatic univalents. A single 10 mg/kg dose was ineffective on the germ cells. The dominant lethal test, performed on females mated with males treated with 100 mg/kg doses, revealed no significant difference from the controls. The findings indicate the mutagenic effect of DDB on the bone marrow and germ cells of mice.

78-2653. Nigam, S. K.; Kashyap, S. K.; Kumar, A.; Gupta, R. C.; Karnik, A. B. (Natl. Inst. Occup. Health, Ah-

medabad, India) **Effect of technical grade DDT on neonatal mice.** *Indian J. Med. Res.* 65(4): 576-578; 1977. (2 references)

Thirty pure inbred Swiss strain neonate female mice were injected sc with 1 mg technical grade DDT in olive oil on the 2nd, 4th, and 6th days after birth. After 300 days histopathological examinations were made of the genital organs with particular reference to the study of the effect of DDT on the development of the ovaries. The period of the first estrus was also carefully recorded. Puberty was advanced and the size of the ovary and uteri were reduced with less number corpora leutea and more follicular cysts suggesting a uterotropic effect.

78-2654. Wall, G. J.; Wilding, L. P.; Smeck, N. E. (Agric. Canada, Univ. Guelph, Guelph, Ont., Canada) **Physical, chemical, and mineralogical properties of fluvial unconsolidated bottom sediments in Northwestern Ohio.** *J. Environ. Qual.* 7(3): 319-325; 1978. (16 references)

Flovial unconsolidated bottom sediments that have the potential to become part of the suspended sediment load in the Maumee River Basin, Ohio, ranged in texture from sandy loams to clays. Particle size analysis by water dispersion and electrolytic dispersion procedures revealed that an average of 34% of the total clay fraction was aggregated into the silt and sand-sized range, indicating that the coarser fraction of bottom sediments may be physically- chemically active. The water-dispersible clay was lower in mica but higher in expandable 0.14 nm (smectite) and quartz constituents than the electrolyte-dispersible clay. The mineralogy of clay-sized bottom sediments (mica, 65 ± 5%; chlorite-vermiculite, 12 ± 5%; quartz, 14 ± 5%; expandable 0.14 nm (smectite) and kaolinite, 5 ± 5%) from upstream agricultural drainage ditches, major Basin tributaries, and from the Maumee River are essentially identical. The 2- to 50-μM fraction was dominated by quartz with secondary amounts of mice, kaolinite, feldspars, and carbonates. Mean calcite, dolomite, and calcium carbonate equivalent values were 4.1, 3.4, and 7.8%, respectively. Calcite dissolution in transport is probable on the basis of observed calcite-dolomite ratios. Organic matter content of the fluvial bottom sediments (3 to 7%) was analogous to Lake Erie bottom sediments and Maumee River suspended sediments. CEC values ranged from 39 to 55 meq/100 g for the total clay fraction collected by electrolyte and water dispersion procedures. Enrichment of heavy metals of bottom sediments over surficial soil material occurred for Cu, Nl, Zn, Cu, and Pb by factors of 1.6, 2.0, 2.3, 3.5, and 3.0, respectively. Traces of herbicides (atrazine, 2-4-D) and insecticides (DDT metabolites, endosulfan) were detected in the filtered stream water samples and bottom sediment materials. Downstream trends in selected physical, chemical, and mineralogical properties could not be related to increased urban influences or increased stream discharge. (Author abstract by permission)

78-2655. Barik, S.; Sethunathan, N. (Lab. Soil Microbiol., Cent. Rice Res. Inst., Cuttack 753006, India) **Metabolism of nitrophenols in flooded soils.** *J. Environ. Qual.* 7(3): 349-352; 1978. (12 references)

Nitrophenols (*p*-, *o*-, and *m*-isomers and 2,4-dinitrophenol) disappeared fairly rapidly from flooded alluvial and organic matter-rich acid sulfate (pokkali) soils inoculated with parathion (*o,o*-diethyl *o,p*-nitrophenyl phosphorothioate)- enrichment cultures from the respective soils. Nitrite, one of the reported end-products of nitrophenol (*o,o*-dimethyl *o,p*-nitrophenyl phosphorothioate) metabolism, accumulated only in inoculated alluvial soil, irrespective of the type of nitrophenol added. In an isotope study, ring cleavage of *p*-nitrophenol leading to carbon dioxide was demonstrated in flooded soils inoculated with parathion-enrichment culture, particularly under stirred conditions. Nitrophenols decomposed also in uninoculated soils; but nitrite and carbon dioxide were not formed. Resting cells of a bacterium, *Pseudomonas* sp. ATCC 29353, readily hydrolyzed parathion and then liberated nitrite from *p*-nitrophenol. In cell-free suspension, the reaction ceased at the *p*-nitrophenol stage. In bacterial cultures, parathion was hydrolyzed without proliferation while subsequent degradation of *p*-nitrophenol involved metabolism leading to bacterial enrichment. (Author abstract by permission)

78-2656. Rahmatullah, M.; Jahan, R.; Chowdhury, A. A.; Faruk, A. B. M.*; Chowdhury, M. S. K. (Dep. Pharm., Univ. Dacca, Dacca 2, Bangladesh) **Effect of organophosphorus insecticides on fermentation processes in *Aspergillus niger*.** *J. Ferment. Technol.* 56(2): 169-172; 1978. (10 references)

The effects of the organophosphorus insecticides dimecron (phosphamidon), lebaycid (fenthion), nogos (dichlorvos), and malathion on the growth and fermentation processes of *Aspergillus niger* were studied. Spores of *A. niger* were incubated with 10-40 μg/ml insecticide in ethanol. Total dry weight of mycelium decreased after all insecticide treatments compared with control (ethanol only), but the effect was not dose-dependent. Total titratable acidity, however, showed sharp decreases with increasing insecticide concentration. This decrease was greater with lebaycid and nogos than with dimecron and malathion. The formation of oxalic and citric acids also decreased with increasing insecticide concentration, the decrease in oxalic acid being greatest with nogos and least with malathion, and the decrease in citric acid being greatest with lebaycid. The concentrations of residual sugar and inorganic phosphate increased over control levels with all four insecticides and the increase was greater at higher dose levels. The data suggest that the four organophosphorus insecticides affect the oxidative processes of *A. niger*

78-2657. Greenlee, W. F.; Poland, A. (Dep. Pharmacol. & Toxicol., Sch. Med. & Dent., Univ. Rochester, Rochester, NY) **An improved assay of 7-ethoxycoumarin *o*-deethylase activity: induction of hepatic enzyme activity in C57BL/6J and DBA/2J mice by phenobarbital, 3-methylcholanthrene and 2,3,7,8-tetrachloro dibenzo-*p*-dioxin.** *J. Pharmacol. Exp. Ther.* 205(3): 596-605; 1978. (25 references)

An improved fluorometric assay of 7-ethoxycoumarin *o*-deethylase activity is presented which is significantly

more sensitive than presently available methods. A simple two-step extraction procedure allows nearly quantitative recovery of the product essentially free of fluorescent impurities. *o*-Deethylating activity was induced 3-fold by 3-methylcholanthrene and 7-fold by phenobarbital in C57BL/6-J mice. Phenobarbital administration caused a 10-fold stimulation of enzyme activity in DBA/2J mice. At least two and possibly more components were involved in the metabolism of 7-ethoxycoumarin as indicated by kinetic analysis. Differential stimulation of the maximal activities associated with these components was noted after the administration of phenobarbital, 3-methylcholanthrene, or 2,3,7,8-tetra chlorodibenzo-*p*- dioxin of 7-ethoxycoumarin *o*-deethylase and aryl hydrocarbon hydroxylase activities in C57BL/6J mice were almost identical and about 10-fold less than in DBA/2J mice similarly treated.

78-2658. Wecker, L.; Kiauta, T.; Dettbarn, W. D. (Dep. Pharmacol., Sch. Med., Vanderbilt Univ., Nashville, TN.) **Relationship between acetyl cholinesterase inhibition and the development of a myopathy.** *J. Pharmacol. Exp. Ther.* 206(1): 97-104; 1978. (24 references)

Paraoxon (0.23 mg/kg) produced a grouped skeletal muscle fiber necrosis evident 24 hr after single injections in rats. Pyridine-2-aldoxime methochloride (10 to 120 min following paraoxon) completely reactivated phosphorylated acetyl cholinesterase (AChE) in junctional and nonjunctional regions of hemidiaphragm muscle. When animals were injected with the reversible cholinesterase inhibitors, physostigmine and neostigmine, they exhibited short lasting fasciculations (20-30 min). Multiple injections to prolong muscle hyperactivity produced myopathies that were qualitatively similar to paraoxon induced myopathy, but less severe. Results of these studies suggest that paraoxon myopathy is initiated by AChE inhibition. The induction of maximal skeletal muscle fiber necrosis depends on a critical duration and degree of enzyme inhibition during which biochemical and physiological alterations may ensue, resulting in a physiopathological state.

78-2659. Brungs, W. A.; Carlson, R. W.; Horning, W. B., II; McCormick, J. H.; Spehar, R. L.; Yount, J. D. (Environ. Res. Lab., Duluth, MN) **Effects of pollution on freshwater fish.** *J. Water Pollut. Control Fed.* 50(6): 1582-1637; 1978. (338 references)

Effects of pesticidal pollutants on freshwater fish have been studied in various investigations. Some of the studies mentioned in this review include the occurrence of pesticide residues in water, stream bed material, fish, and soil; toxicity studies of five ricefield pesticides to the mosquito-fish and green sunfish under laboratory and field conditions; toxicity studies of methoxychlor and naled to different life stages of landlocked Atlantic salmon; uptake and elimination of endrin in various tissues of channel catfish; effects of several solvents on the inhibition of ATPase activities from catfish brain and cockroach muscle by DDT, toxaphene, and Plictran (cyhexatin); the *in vivo* effect of an organophosphorus insecticide, monocrotophos, individually and in combination with endrin and Sevin (carbaryl); and the effect of 0.33 mg/l of parathion on general locomotor behavior of goldfish. Herbicide studies cited included the removal of weeds with herbicides in relation to its effect on fish; toxicity studies of diquat and cutrin to fingerling brown trout; and the toxicity of xylene to trout in artificial streams.

78-2660. Buikema, A. L., Jr.; Herricks, E. E. (Virginia Polytech. Inst. & State Univ., Blacksburg, VA) **Effects of pollution on freshwater invertebrates.** *J. Water Pollut. Control Fed.* 50(6): 1637-1648; 1978. (123 references)

Methods and procedures for determining toxicant effects of toxic concentrations in invertebrates are reviewed. Terrestrial aquatic model ecosystems have been used to evaluate the environmental fate of benzo(a)pyrene, benzidine, vinyl chloride, toxaphene and chlordane. Studies of community effects include both quantification of experimental tests and detection of pollutant residues in a variety of ecosystems. Specific studies are reported on cladocera, copepods, amphipods, insects, molluscs, crayfish, worms, and protozoans.

78-2661. Scura, E. D.; Theilacker, G. H. (Scripps Inst. Oceanogr., Univ. California, San Diego, CA) **Transfer of the chlorinated hydrocarbon PCB in a laboratory marine food chain.** *Mar. Biol.* 40(4): 317-325; 1977. (33 references)

The transfer of chlorinated hydrocarbons (CHC, primarily PCB) in a laboratory simulation of a three trophic level marine food chain consisting of the algal flagellate *Dunaliella* sp., the rotifer *Brachionus plicatilis*, and the larva of the northern anchovy *Engraulis mordax* is reported. CHC were introduced into the seawater at concentrations representing near-shore conditions off the southern California coast without the use of dispersing agents. At the time of first sampling, 5 days after inoculation, each trophic level appeared to be in steady state. Apparent partition coefficients were calculated for each trophic level. CHC contamination in the diet of the rotifers and anchovy larvae was also calculated. Unfed anchovy larvae accumulated the same amount of CHC as fed larvae, and the final concentration depended on the CHC concentration in the seawater. It is suggested that CHC accumulation is not a food-chain phenomenon. Rather it is the result of direct partitioning of the compounds between the seawater and the test organisms.

78-2662. Smith, E. A.; Mayfield, C. I. (Dept. Biol., Univ. Waterloo, Waterloo, Ont., Canada) **Effects of paraquat on selected microbial activities in soil.** *Microb. Ecol.* 3(4): 333-343; 1977. (28 references)

Effects of various concentrations of paraquat on selected microbial activities in soils were examined. In a nonamended sandy loam soil paraquat (as Gramoxone), applied at five times the suggested field application rate (10 lb/A = 115 $\mu g/cm^2$), increased the numbers of bacteria, actinomycetes, and fungi during 14 days at 25°C. Other com-

pounds in the Gramoxone formulation were suggested to be responsible for this increase rather than the paraquat itself. Treatment at one and five times the normal rate reduced carbon dioxide evolution by 44% and 67%, respectively, during 12 days in soil amended with 2% glucose. Similar treatments reduced carbon dioxide evolution in 1% straw amended soil by 39% and 58%, respectively, during 28 day incubation. Cellulose decomposition of cotton duck containing 13 and 176 μg of paraquat/mg material was inhibited for 15 and 28 days, respectively, in soil containing a large population of cellulolytic microorganisms. A concentration of 5000 μg/g of paraquat inhibited nitrification in soil by 44% during 28 days at 20°C. Paraquat inhibited ethylene reduction in artificial aggregates of soil amended with 2% glucose and incubated anaerobically at 25°C. Nitrogenase activity in aggregates was inhibited by 43% and 52% at paraquat concentrations of 580 and 720 μg/g respectively. The inhibitory effects of paraquat were reduced when soil was amended with organic matter in the form of peat or straw. The availability of paraquat controlled the toxicity of the chemical to soil microorganisms.

78-2663. Fasco, M. J.; Piper, L. J.; Kaminsky, L. S. (Div. Lab. & Res., New York State Dep. Health, Albany, NY 12201) **Differences in the interactions of R and S warfarin with hepatic microsomal cytochrome *x* P-450.** In: *Microsomes and Drug Oxidations.* Ullrich, V., Roots, I., Hildebrandt, A., Estabrook, R. W., Cooney, A. H., eds. (New York: Pergamon Press): pp. 136-143; 1977. (18 references)

A series of monohydroxylated products were formed from the enantiomers of warfarin by rat hepatic cytochrome P450. Patterns of products vary for R and S warfarin and after induction of P450 by phenobarbital (PB) and cytochrome P448 by 3-methylcholanthrene (MC). The binding of R and S warfarin to cytochrome P450 was studied using difference spectrophotometry to determine how the product patterns produced are influenced by the heterogeneity of P450. The studies suggested that R and S warfarin bind to two separate forms of cytochrome P450 and two separate forms of cytochrome P448, all of which differ from uninduced cytochrome P450. The variety of monohydroxylated metabolites of R and S warfarin is a consequence of the interactions with these different forms of cytochrome P450.

78-2664. Franklin, M. R. (Dep. Biopharm. Sci., Coll. Pharm., Univ. Utah, Salt Lake City, UT 84112) **The inhibition of mixed-function oxidation reactions by amphetamines in liver and lung microsomes.** In: *Microsomes and Drug Oxidations.* Ullrich, V., Roots, I., Hildebrandt, A., Estabrook, R. W., Conney, A. H., eds. (New York: Pergamon Press): pp. 284-291; 1977. (28 references)

The inhibition of three mixed-function oxidase (MPO) reactions by amphetamine concentrations of 0.017 to 2.00 m*M* is described. This inhibition was greatest for those compounds which were able to form metabolic intermediate complexes with cytochrome P450 at fast rates. The least sensitive of the enzymes studied was ethylmorphine *N*-demethylase. Intermediate in strength was *p*-nitroanisole *o*-demethylase; benzopyrene hydroxylase was the most sensitive reaction to amphetamine inhibition. The effect of piperonyl butoxide was similar to that of amphetamine. The formation of the metabolic intermediate complexes prior to initiation of the MFO reactions increased the degree of inhibition by adding a noncompetitive component to the initial competitive inhibition. This increased inhibition was only evident in microsomes from phenobarbital pre-treated animals, not those from untreated or 3-methylcholanthrene pre-treated animals. Rabbit MFD reactions were more susceptible than those of the rat. The formation of these complexes from amphetamines can be significant in the inhibition of MFO reactions.

78-2665. Schulte-Hermann, R. (Inst. Toxicol. & Pharmakol., Philipps Univ., D-3550 Marburg, Germany) **Stimulation of liver growth and mixed-function oxidase by α-hexachlorocyclohexane: separation of inductive pathways.** In: *Microsomes and Drug Oxidations.* Ullrich, V., Roots, I., Hildebrandt, A., Estabrook, R. W., Conney, A. H., eds. (New York: Pergamon Press):; 1977. (19 references)

Hexachlorocyclohexane α-isomer (α-BHC, α-HCH) was shown to stimulate liver growth and mixed-function oxidase activity. The increase of DNA synthesis requires the consumption of dietary protein 5-8 hr before initiation of DNA replication and can be blocked by a low dose of actinomycin D in the first few hours after α-HCH treatment. The increase of cytochrome P450 and of *N*-demethylation do not require dietary protein and are not sensitive to even higher doses of actinomycin D. The results of this study suggest that the inductive pathways leading to cell proliferation and mixed-function oxidase multiplication diverge a few hours after initiation of the inductive process.

78-2666. Vesell, E. S. (Dep. Pharmacol., Coll. Med., Pennsylvania State Univ., Hershey, PA 17033) **Effects of disease states on drug disposition in man.** In: *Microsomes and Drug Oxidations.* Ullrich, V., Roots, I., Hildebrandt, A., Estabrook, R. W., Conney, A. H., eds. (New York: Pergamon Press): 628-645; 1977. (71 references)

One of the factors affecting drug disposition in experimental animals as well as humans is the inhibition or hepatic induction of microsomal enzymes due to insecticide exposure. If environmental agents such as these chemicals were mainly responsible for the large variations in drug disposition seen among normal subjects, it would be anticipated that with increasing age there would be increasing rates of drug metabolism. Such thinking is based on the fact that most environmentally encountered chemicals such as DDT, PCB, and polycyclic hydrocarbons are potent inducing agents. However, inter-individual variations in drug disposition cannot be explained simply on this basis of increasing exposure with time to potent inducing agents. Clearly other factors than environmental insecticide exposure are responsible for variations in drug metabolism among individuals.

78-2667. Parke, D. V. (Dep. Biochem., Univ. Surrey, Guildford, England) **The activation and induction of biphenyl hydroxylation and chemical carcinogenesis.** In: *Microsomes and Drug Oxidations.* Ullrich, V., Roots, I., Hildebrandt, A., Estabrook, R. W., Conney, A. E., eds. (New York: Pergamon Press): pp. 721-729; 1977. (26 references)

Observations are presented which suggest that the activation of biphenyl hydroxylase represents a highly specific change in the physico-chemical state of the endoplasmic reticulum, produced by interaction with carcinogenic chemicals or their metabolites and resulting in a change in the nature of cytochrome P450 which, although apparently reversible, is not repeatable. Further evidence suggests that the activation of biphenyl 2-hydroxylase following the administration of carcinogens *in vivo* or the incubation of microsomal preparations with carcinogens plus NADPH *in vitro* leads to the metabolic activation of the carcinogen and formation of a highly reactive metabolite which, in addition to alkylating the nuclear DNA, also damages the endoplasmic reticulum - the site of formation of the reactive metabolite. Thus the metabolism of the cell is switched to the fetal state of rapid growth and rapid cell division, potentiating the damage to the DNA and contributing to the malignant transformation.

78-2668. Ficsor, G.; Bordas, S.; Stewart, S. J. (Dep. Biomed. Sci., Western Michigan Univ., Kalamazoo, MI) **Mutagenicity testing of benomyl, methyl-2- benzimidazole carbamate, streptozotocin and *N*-methylin *Salmonella typhimurium in vitro* and in rodent host-mediated assays.** *Mutat. Res.* 51(2): 151-164; 1978. (14 references)

The fungicide benomyl and its commercial preparations Fundazol 50WP and Benlate 50WP and the benomyl metabolite methyl-2-benzimidazole carbamate (carbendazim) and its commercial preparation MBC 50WP were tested for mutagenicity in *in vitro* spot tests, in microsomal plate assay, in liquid-culture treatments, or in rodent host-mediated assay. The base-pair substitution *Salmonella typhimurium* mutant *his*G46 and the *his*G46-bearing *uvr*B excision-repair- deficient mutants TA100, TA1530, TA1535 or TA1950 were used as test organisms. Captan 50WP, streptozotocin (SZN), *N*-methyl-*N*- nitro-*N*- nitroso- guanidine (MNNG), 2-aminopurine and *N*-acetylamino fluorene were used as positive control compounds. In non-overlay spot tests Benlate 50WP was not mutagenic over a dose range of 50-5000 μg/spot in *his*GP46 and TA1535. In overlay spot tests 50 or 100 γ/spot Benomyl, MBC, Fundazol 50WP, Benlate 50WP and MBC 50WP were tested in *his*C46, TA1530 or TA1950. Only a non-commercial MBC sample at 100 μg/spot showed weak mutagenic activity in *his*G46. In microsomal activation plate assay MBC, benomyl, Fundazol 50WP and Benlate 50WP were tested in TA100 over a dose range of 50-2000 μg/plate. None of the compounds showed mutagenicity. In a 20-hr liquid-culture treatment of 10, 100, 1000 and 10,000 μg/ml Fundazol 50WP were not mutagenic in TA1530. In 1-hr liquid-culture treatments benomyl, Benlate 50WP or Fundazol 50WP failed to induce mutations in *his*G46, TA100 or TA1950 over a dose range of 0.25-1000 μg/ml. Appropriate positive controls were mutagenic in each experiment. The consistently negative results in this study with commercial MBC and benomyl preparations are contrary to positive results reported earlier with similar methods and similar commercial preparations. Possible reasons to explain the different results are presented. The alkylating agents SZN and MNNG induced fewer mutations in TA1530 and TA1950 *uvr*B excision-repair- deficient strains than in the *his* G46 excision- proficient strain, indicating that with these mutagens excision-repair is also a mutation-prone process. In rodent host-mediated assays with Fundazol 50WP in mice 3 consecutive subcutaneous hourly doses of 500 mg/kg in *his* G46 and TA1950 and in rats or mice an oral dose of 4000 mg/kg in TA1950 were not mutagenic. The positive control SZN was mutagenic. (Author abstract by permission)

78-2669. Kappas, A. (Biol. Dept., Nucl. Res. Cent. Democritus, Athens, Greece) **On the mechanisms of induced somatic recombination by certain fungicides in *Aspergillus nidulans.*** *Mutat. Res.* 51(2): 189-197; 1978. (29 references)

Four fungicides interfered with the segregation of chromosomes at mitosis of *Aspergillus nidulans* by increasing the somatic recombination, shown as color sectors in green colonies, in a strain heterozygous for spore color mutations. In an attempt to discover the mechanisms by which these fungicides increased the somatic recombination, a phototrophic diploid strain, heterozygous for color and several other appropriate markers in all chromosomes, was used which enabled the detection and classification of all color recombinants to be made by genetic analysis. The fungicides investigated were: benomyl (methyl-l- (butylcarbamoyl)- 2-benzimidazole carbamate), a benzimidazole derivative; Botran (dichloran 2,6-dichloro- l-nitroaniline) and chloroneb (1,4-dichloro 2,5-dimethoxybenzene) of the aromatic hydrocarbon group of fungicides; and the antibiotic actinomycin D. At least three different mechanisms, non-disjunction, mitotic crossing-over and breakage-deletion, were found to be responsible for the recombinogenic activity of the compounds studied. (Author abstract by permission)

78-2670. Carere, A.; Ortali, V. A.; Cardamone, G.; Torracca, A. M.; Raschetti, R. (Ist. Super. Sanit., Rome, Italy) **Microbiological mutagenicity studies of pesticides *in vitro.*** *Mutat. Res.* 57(3): 277-286; 1978. (27 references)

Fourteen pesticides were tested as pure compounds for the induction of point mutations in four strains of *Salmonella typhimurium* TA1535, TA1536, TA1537 and TA1538 - in the presence and in the absence of rat-liver microsomal fractions and for the induction of resistance to low concentrations of streptomycin in the filamentous bacterium, *Streptomyces coelicolor.* The technique used was essentially the so-called spot test. The pesticides investigated were: aminotriazole (amitrole), benomyl, captafol, captan, dichlorvos, dalapon-Na, dinobuton, dodine, ioxynil, mecoprop, neburon, picloram, triallate and trichlorfon. In *Salmonella,* captan and triallate were mutagenic on the TA1535 strain; dichlorvos and trichlorfon were negative in the spot test but mutagenic after incubation in liquid cultures of strain

TA1535. Using the *S. coelicolor* forward-mutation test, aminotriazole, dichlorvos, picloram, trichlorfon and triallate were mutagenic with the spot test technique: captan showed a weak mutagenic activity with a plate-incorporated technique. (Author abstract by permission)

78-2671. Mayer, F. L., Jr.; Mehrle, P. M., Jr.; Dwyer, W. F. (Fish Pestic. Res. Lab., US Fish & Wildl. Service, Columbia, MO 65201) **Toxaphene: chronic toxicity to fathead minnows and channel catfish.** *Natl. Tech. Inform. Serv.* PB-271,695: 50 p.; 1977. (48 references)

Fathead minnows (*Pimephales promelas*) and channel catfish (*Ictalurus punctatus*) were continuously exposed to several toxaphene concentrations (13-630 μg/l) in flow-through diluter systems for 8 to 10 mo. Growth and backbone quality of adult fathead minnows were decreased at 97 and 173 ng/l exposures, but adult channel catfish were not affected by toxaphene. Effects on reproduction were observed only in channel catfish in the 630 μg/l concentration: the period from pairing to spawning was increased and the amount of gelatinous matrix surrounding the eggs were reduced. Survival of fathead minnows was not affected by toxaphene, but the no-effect concentration for fry growth and bone quality was below 54 and 97 ng/l, respectively. Channel catfish fry survival and growth were reduced in the 299 and 630 ng/l exposures, and bone quality was altered in concentrations as low as 72 ng/l. The maximum toxaphene accumulation from water to fish was 69,000 times in fathead minnows and 50,000 times in channel catfish. Toxaphene was excreted very slowly in both species. (Author abstract by permission)

78-2672. Seifert, J.; Buchar, E. (Inst. Pharmacol., Czechoslovak Acad. Sci., CS-12800 Prague 2, Czechoslovakia) **Increased transport of (G-^{14}C)cytidine into rat liver after administration of α-hexachlorocyclohexane.** *Naunyn-Schmiedebergs Arch. Pharmacol.* 303(1): 101-105; 1978. (19 references)

Changes which occur in the transport of exogenously administered (G-^{14}C-labeled) cytidine during the induction of MFO and activation of proliferation in the liver after administration of α-HCH (α-BHC) are studied. Cytidine was used in the dose range of 0.003 to 100 μmol per animal. After α-HCH administration the transport of cytidine was markedly activate when the concentration of the nucleoside administered was low. The differences between control and experimental groups disappeared after the administration of higher doses of the nucleoside. Incorporation of cytidine into RNA cytosine was enhanced after the administration of α-HCH. The degree of utilization of labeled cytidine for the RNA synthesis decreased in proportion to the logarithm of its dose, both in controls and in the experimental animals. Increased cyıidine transport was noted even between the 4th and 6th days after administration of a single dose of α-HCH.

78-2673. Vreman, K.; Tuinstra, L. G. M.; Bakker, J.; van den Hoek, J.; Roos, A. H.; de Visser, H.; Westerhuis, J. H. (Res. Inst. Anim. Feed. & Nutr. Hoorn, Lelystad, The Netherlands) **Aldrin, heptachlor and β-hexachlorocyclohexane to dairy cows at three oral dosages. 2. Residues post partum in milk and body fat of cows fed on pesticides in the dry period.** *Netherlands J. Agric. Sci.* 25(4): 303-312; 1977. (7 references)

Cows received three levels each of aldrin, hepatchlor and β-HCH (β-BHC) together with concentrate at 0.5 mg, 1.0 mg or 2.0 mg/cow daily during the whole dry period. Aldrin and heptachlor were below the detection level of 0.01 mg/kg fat. In most cases contents of β-heptachlor epoxide were below 0.1 mg/kg even for the highest dosage. For β -HCH and dieldrin in milk fat, fairly good agreement was found between adjusted values just after calving and values for cows in early and late lactation, both at the end of the dosing period. In body fat a considerable variation in pesticide content was noted, particularly with dieldrin in cows receiving the highest dose level.

78-2674. Matsummura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI) **Absorption, accumulation, and elimination of pesticides by aquatic organisms.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed., (New York: Plenum Press): pp. 77-105; 1977. (9 references)

To study the absorption, accumulation, and elimination of pesticides by aquatic organisms, fish were exposed to radio labeled DDT on sand or lake sediment in an equilibrium type model system, thus by-passing the water solubility problems of many pesticides. The rate of pesticide accumulation in organisms was affected by such things as the amount of pesticides, size of the ecosystem, temperature, and physical and chemical characteristics of the pesticides. The chemical nature of the pesticide is characterized by liposolubility, partition coefficients, water solubility, stability against degradative action by biological systems and sunlight, and adsorption properties to soil. It was found that the rate of desorption of pesticides is species-specific.

78-2675. Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois, Chicago, IL) **Elimination of pesticides by aquatic animals.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed., (New York: Plenum Press): pp. 107-125; 1977. (42 references)

The absorption of chlorinated hydrocarbon insecticides, by fish directly from the water and via the ingestion of contaminated food, occurs simulateneously with the elimination of pesticides; the balance of the two processes determines the fate of the insecticide in the tissue. The rate of elimination depends on the solubility of the pesticide, but generally 50 to 90% of the chemical can be eliminated within 4 wk; other factors affecting elimination are starvation, which results in rapid elimination in the case of dieldrin, the degree of contamination of the water, and the degree of contamination of the food. The elimination of pesticides by aquatic invertebrates such as fresh water fleas, shrimp, mussels, clams, and oysters is also briefly discussed.

78-2676. Hart, L. G. (Pharmacol. Br., NIEHS, Research Triangle Park, NC) **An introduction of pesticide degradation**

by aquatic organisms. In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed., (New York: Plenum Press): pp. 167-170; 1977. (16 references)

In an overview of the biotransformation or metabolism of pesticides by aquatic organisms, the different types of initial reactions are discussed. These reactions include oxidation, reduction, hydrolysis, and conjugation, and their products are generally more polar than the parent compound. Hydrolysis of esters as a first phase reaction is usually associated with organophosphates and carbamates; reduction and GSH-mediated chlorination occurs in organochlorine pesticides. From the literature it appears that many common marine species are more deficient than mammals in their ability to metabolize xenobiotics. It is pointed out that health, age, diet, water temperature, and the presence of other xenobiotics affect metabolism.

78-2677. James, M. O.; Fouts, J. R.; Bend, J. R. (NIEHS, Research Triangle Park, NC) **Xenobiotic metabolizing enzymes in marine fish.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed., (New York: Plenum Press): pp. 171-189; 1977. (16 references)

Xenobiotic metabolism was studied in marine fish and crustacea *in vivo* and *in vitro.* Oxidative metabolism of pesticides by cytochrome P450 dependent mixed function oxidases was studied, *in vitro,* as well as the metabolism of epoxides and arene oxides, the products of oxidation. *In vivo* experiments involved the administration of a polychlorinated biphenyl, 2,4,5,2′,5′- pentachlorobiphenyl, and the herbicides, 2,4-D and 2,4,5-T, to marine species. It was found that marine species tend to accumulate lipophilic compounds and that their oxidative metabolism of xenobiotics is slower than that of mammals. Cytochrome P450 dependent oxidative pathways of crustaceans are different from those of fish and mammals. The detoxication reactions are also discussed. It is concluded that when marine and mammalian species have similar metabolic pathways, the metabolism and excretion of the xenobiotics is much slower in marine species than in mammalian species.

78-2678. Khan, M. A. Q.; Korte, F.; Payne, J. F. (Dep. Biol. Sci., Univ. Illinois, Chicago, IL) **Metabolism of pesticides by aquatic animals.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed., (New York: Plenum Press): pp. 191-220; 1977. (112 references)

The metabolism of pesticides by aquatic animals is carried out via oxidation reactions, hydrolysis, and reduction, followed by excretion. The enzymes involved in the metabolism of pesticides are mixed function oxidases, epoxide hydrase, glutathione- *S*-transferase, glutathione dependent dehydrochlorinase, nitro- and azo- reductase and some esterases. The metabolism of organophosphates such as parathion, malathion, methyl-parathion, diazinon, and TOCP is described. The metabolism of organochlorine compounds such as DDT, which is metabolized to DDE in most aquatic species, as well as the metabolism of methoxychlor, dicamba, PCP, and TFM are described. The metabolism of carbmates, rotenone, and mercurial compounds is also covered.

78-2679. Booth, G. M.; Ferrell, D. (Dep. Zool., Brigham Young Univ., Provo, UT) **Degradation of dimilin by aquatic foodwebs.** In: *Pesticides in Aquatic Environments.* Khan, M. A. Q., ed., (New York: Plenum Press): pp. 221-243; 1977. (7 references)

The fate of the insect growth regulator Dimilin (diflubenzuron) in the food web of a lake and surrounding ponds was examined. The concentration of the compound was measured in the water and soil, and in microorganism, algae, and channel catfish in the system after 4 applications of Dimilin. It was found that residues do not accumulate in the water, soil, or aquatic vegetation. The blue-green alga *Plectonema boryanum* was found to rapidly metabolize the residues of Dimilin. *Pseudomonas* metabolized the pesticide if there were no alternative carbon sources. Dimilin did not bioaccumulate in channel catfish.

78-2680. Kurtz, P. J. (Environ. Hyg. Agency, US Army, Aberdeen Proving Ground, MD 21010) **Behavioral and biochemical effects of the carbamate insecticide, Mobam.** *Pharmacol. Biochem. Behav.* 6(3): 303-310; 1977. (23 references)

The relation between cholinesterase (ChE) activity and behavioral changes after exposure to a carbamate insecticide was studied using the insecticide Mobam. Decreases in rat plasma, erythrocyte and brain ChE levels after ip injection of 1 to 5 mg/kg Mobam were compared with decrements in both spontaneous motor activity and conditioned avoidance performance produced by this compound. Significant effects were noted with all five measured phenomena at doses producing no obvious clinical signs. In albino rats, a dose of 2 mg/kg significantly depressed plasma and erythrocyte ChE activity and decreased motor activity 15 min after injection, but only higher doses (3 and 5 mg/kg) significantly depressed brain ChE activity and avoidance performance. In Long-Evans rats both brain ChE activity and avoidance performance were significantly reduced by the lower (2 mg/kg) dose. Avoidance impairments noted after the 3 mg/kg dose could be prevented by prior injection of atropine sulfate. Both central and peripheral ChE changes may be important in determining the nature of the behavioral effects noted after exposure to Mobam.

78-2681. Becker, E. L. (Connecticut Health Cent., Farmington, CT) **Organophosphorus inhibitors and mechanisms of cell activation.** *Monogr. Physiol. Soc. Philadelphia* 1:7-14; 1977. (16 references)

There is evidence that physiological functions such as chemotaxis, erythrophagocytosis, movement of lymphocytes, and the secretion of histamine or serotonin by mast cells, basophils, and platelets require esterase activation. It was found that organophosphorus compounds (e.g, DFP) inhibit these immunologically and nonimmunologically activated systems, and they have been found to be useful in studying the esterase activation step. It is suggested that organophosphorus compounds specific for certain esterases could be developed and put to use in the area of disease therapy. The compounds would have to be non-toxic, highly active, and sufficiently stable in the body.

78-2682. Wainwright, M.; Kowalenko, C. G. (Soil Res. Inst., Cent. Exp. Farm, Ottawa, Ont., Canada) **Effects of pesticides, lime, and other amendments on soil ethylene.** *Plant Soil* 48(1): 253-258; 1977. (18 references)

The changes occurring in soil ethylene levels following treatment with the fungicides captan and thiram, the herbicides, 2,4-D and paraquat, and the insecticides, carbofuran and endosulfan, were studied. Changes resulting from the addition of lime, N-serve, chitin, cellulose, urea, and ground barley straw to the soil were also examined. The herbicides and insecticides were found to have little effect on ethylene production. Captan and thiram increased the concentration of ethylene in the atmosphere above the soil. This increased ethylene production could be a result of lysis of fungi, increases in numbers of heterotrophic bacteria and thus enhanced synthesis of ethylene, or a change in the composition of fungal populations favoring ethylene producers.

78-2683. Mauras, Y.; Pareyre, C. (Lab. Bot. & Toxicol., UER Sci. Med. & Pharm., Angers, France) **Cytotoxicite comparee de la simazine, du paraquat et d'une association simazine-paraquat sous leurs formes commerciales. [Comparative cytotoxicity of simazine, of paraquat, and of a simazine-paraquat combination in their commercial forms.]** *Plant. Med. Phytother.* 1(1): 53-57; 1977. (4 references) (French)

The cytotoxic effect of paraquat and simazine on an undifferentiated cellular population from the radicular meristem of *Allium sativum* was compared with that of their commercial combination Terraklene, a mix of 400 g simazine and 100 g paraquat/l, over a 24 hr period. The mitostatic effect achieved with 7.33 mg paraquat/100 ml over 24 hr was comparable to that achieved by 62.5 mg simazine/100 ml. While using Terraklene, the same effect was achieved in 18 hr with 2.75 mg paraquat and 11 mg simazine/100 ml demonstrating that the cytotoxicity of Terraklene is far superior to that of the sum of their components used separately. The mitostatic effect of both parauat and simazine is reversible only if it is of short duration, and the same applies to Terraklene. A simple mix of both components, at levels contained in Terraklene, was 50% less effective than the same amount of the two active components contained in Terraklene which demonstrates the importance of the excipient.

78-2684. Fedorko, A.; Kozlowska, J.; Mianowska, E. (Dep. Agrocenol., Inst. Ecol., Polish Acad. Sci., Dziekanow Lesny, Poland) **The effects of some insecticides on nematodes of different ecological groups.** *Pol. Ecol. Stud.* 3(2): 79-88; 1977. (2 references)

The toxicity of the following insecticides employed in the cultivation of the potato on nematodes of different ecological groups was studied: methoxychlor, lindane, dioxacarb, propoxur, carbaryl, lindane plus carbaryl, chlorfenvinphos, fenitrothion, IPO-62, and IPO-63. The eusaprobiont, *Eudiplogaster* sp., was the most sensitive of the organisms studied to the insecticides, and *Neoaplectana carpocapsae* was the most resistant. The chlorinated hydrocarbon insecticides were the least toxic of all insecticides studies to all species. With the exception of lindane plus carbaryl, all of the insecticides in concentrations recommended for practical appliction did not kill nematodes or interfere with their development or ability to infect insects. Lindane plus carbaryl caused a high mortality among *Pristionchus uniformis*, even in relatively low concentrations; neither lindane nor carbaryl alone was toxic to this species. The most toxic of the insecticides to free-living nematodes were the organophosphates chlorfenvinphos, fenitrothion, IPO-62, and IPO-63.

78-2685. Trnkova, J. (Inst. Vertebr. Res., Czech Acad. Sci., 67502 Konesin, Czechoslovakia) **Die toxische Wirkung des Endrins auf aquatische Wirbellose. [Toxic effect of endrin on aquatic invertebrates.]** *Prirodoved. Pr. Ustav. Cesk. Akad. Ved Brne* 11(3): 1-30; 1977. (24 references) (German)

The LC50 and LC90 of endrin was determined on 23 species of aquatic invertebrates to assess the risk of endrin contamination of surface waters. The most sensitive stagnant water species tested was *Daphnia pulex*, with a 72-hr LC50 values of 8 pg/l at 20°C. The least sensitive species was *Tubifex tubifex*, with a 72-hr LC50 value of 21.11 mg/l at 20°C. Juvenile stages of model species such as *Asellus aquaticus, Cloeon dipterum* and *Culex pipiens* were generally more sensitive than adults. Of the running water species, larvae of *Caenis robusta* were most sensitive, with LC50 (72 hr) of 11 ng/l at 14°C; *Planaria gonocephala* was the most resistant, with an LC50 (72 hr) of 0.1 mg/l at 15°C. It was found that the results of testing could be greatly affected by the test conditions, such as age of the prepared toxicant emulsion, emulsion temperature, and absence of a substrate in the test vessels. Endrin accumulated in the tissues of some aquatic invertebrates to levels up to 100 times greater than the concentration of the test emulsion and persisted in these tissues for several months.

78-2686. Wohlgemuth, E. (Inst. Vertebr. Zool., Czech. Acad. Sci., Brno 60365, Czechoslovakia) **Toxicity of endrin to some species of aquatic vertebrates.** *Prirodoved. Pr. Ustav. Cesk. Akad. Ved Brne* 11(6): 1-38; 1977. (36 references)

Some aspects of the toxicity of endrin to aquatic vertebrates were investigated in ten fish and one frog species. In six fish species and in tadpoles the toxicity of endrin was studied for the first time. Endrin was highly toxic to fish. Of the economically important varieties, particularly the members of Salmonidae were very sensitive to the chemical and the members of Cypinidae showed a lower sensitivity. Toxicity of endrin increased with increasing temperatures. Different ontogenetic stages showed different sensitivities. Fish in the embryonic period of development were more resistant than the subsequent developmental stages. Short-term exposure to dilute concentrations of endrin also showed toxic effects on fish. The high toxicity is a serious danger to the life of aquatic vertebrates. Any accident may result in a catastrophe. Thus it is necessary to apply all endrin-based preparations to control *Microtus arvalis* only under strict observance of all safety regulations.

78-2687. Miura, T.; Takahashi, R. M. (Mosq. Control. Res. Lab., Fresno, CA 93727) **Effects of dimilin on nontarget organisms: repeated utilization on the same habitats as a mosquito larvicide.** *Proc. Pap. Annu. Conf. Calif. Mosq. Control Assoc.* 44: 86-89; 1976. (7 references)

Two mosquito breeding habitats were studied to determine the effects of dimilin (diflubenzuran) on nontarget organisms. Dimilin was applied as a 25% WP formulation by aircraft. A total of 35 taxa including planktonic organisms, insects, spiders, and fish were observed in the study sites. Immediate effects were noted on planktonic crustaceans and larval chironomids and shore flies. The water flea population was completely exterminated. The copepod population was reduced. Water boatmen and shore fly populations were not changed. It was determined that at the rates used for mosquito control, Dimilin was relatively safe to nontarget organisms. The populations of water fleas and mayfly nymphs were able to thrive at the end of 8 consecutive applications for a 2 yr period. It was concluded deleterious effects of dimilin may be milder than those of raw untreated septic industrial wastewater.

78-2688. Chakrabarty, A. M.; Friello, D. A.; Bopp, L. H. (Gen. Elec. Res. & Dev. Cent., Schenectady, NY 12301) **Transposition of plasmid DNA segments specifying hydrocarbon degradation and their expression in various microorganisms.** *Proc. Nat. Acad. Sci. USA* 75(7): 3109-3112; 1978. (18 references)

Evidence is presented which suggests that some hydrocarbon degradative genes which occur naturally as part of conjugative plasmids in *Pseudomonas putida* strains can be dissociated from the conjugative plasmids to form nonconjugative plasmids and can readily form plasmid cointegrates during transfer with sex-factor plasmids. Such degradative genes can undergo further translocation from the plasmid cointegrates onto other replicons and then promote gene inactivation at or near the site of insertion. Speculation on this mechanism for a detoxification method of 2.4-D and DDT is given.

78-2689. Puiseux-Dao, S.; Jeanne-Levain, N.; Roux, F.; Ribier, J.; Borghi, H.; Brun, C. (Lab. Biol. Cell. Veg., Univ. Paris, Paris, France) **Analyse des effets du lindane, insecticide organochlore au niveau cellulaire. [Analysis of the effects of the organochlorine insecticide lindane at the cellular level.]** *Protoplasma* 91(3): 325-341; 1977. (25 references) (French)

The sensitivity of *E. coli, Bacillus thuringiensis, Tetrahymena pyriformis,* and *Euglena gracilis* to lindane, the effects of this insecticide on cellular morphogenesis of giant cells of *Acetabularia editerranea,* cellular division of the roots of *Allium sativum,* and golgi and lysosomal activity of chick embryo hepatocytes were studied by spectrophotometry, and cytological, biochemical, and cytochemical methods. Generally, lindane does not influence bacterial growth but it can inhibit eucaryotic multiplication of microorganisms to varying degrees depending on the species. This inhibition is reversible when lindane action is of short duration and occurs during mitosis in plant cells, but apparently not in animal cells. The slowdown in morphogenesis of *Acetabularia* is probably due to a decrease in the cytoplasmic flow. DNA synthesis continues in cells exposed to the action of lindane. One mode of action suggested, namely that it acts on cellular membranes (indicated by the resistance to osmotic shocks of *Acetabularia* exposed to lindane), would explain why lindane affects eucaryotes but not procaryotes, and why it affects mitosis in plant but not animal cells along with other manifestations.

78-2690. Subrtova, D. (Dep. Morphol. Sci., Fac. Med., Univ. Karlov, Hradci Kralove, Czechoslovakia) **Ultrastrukturalni zmeny na mikrovaskularnim recisti kuze krysy po aplikaci organofosfatu. [Ultrastructural changes in the microvascular blood bed of the rat skin after the administration of organophosphate.]** *Sb. Ved. Pr. Lek. Fak. Karlovy Univ. Hradci Kralove* 19(4 suppl.): 451-461; 1977. (11 references) (Czech)

Potential degenerative ultrastructural changes in the microvascular blood bed of the rat skin induced 2 and 8 min after the administration of 6 LD50 doses of the organophosphorus compound *o*-ethyl-*S*-(2-dimethyl aminoethyl)-methyl phosphothiolate applied percutaneously with a platinum loop under the skin were studied under the electron microscope by comparing contaminated and control tissue sections fised with a 2% solution of osmic acid, contrasted and embedded in synthetic resin. The capillaries of animals killed 2 min following the administration of the organophosphorus compound were no different from those of control animals. Those from rats killed 8 min following contamination exhibited signs of irritation of the endothelium and of pericytes, and conspicuous enlargement of periendothelial space filled with granular filamentous matter stemming probably from the basal laminae of pericytes and endothelial cells.

78-2691. Bondari, A. A. (Vet. Inst., Leningrad, USSR) **Izuchenie deistviya γ-luchei i armina na atsetilkholinesterazu. [Effect of γ-radiation and armine on acetylcholinesterase.]** *Radiobiologiya* 18(3): 426-429; 1978. (17 references) (Russian)

The rate constants for interaction of armine were the same in the case of solutions of acetyl cholinesterase prepared from human and cattle blood, irradiated with 22.4 and 120 krad γ-radiation (^{137}Cs), as in the case of non-irradiated preparations. The enzyme activity was reduced by 30% in the irradiated solutions. This suggests that no changes occurred in the reactivity of intact remaining enzyme centers which bring about acetylcholine hydrolysis.

78-2692. Moustafa, M. A.; El-Sherif, M. M. T. (Fac. Vet. Med., Zagazig Univ., Zagazig, Cairo, Egypt) **Biochemical study on the blood of normal sheep as well as those experimentaly intoxication with the organophosphorus compound Neguvon.** *Pak. J. Biochem.* 9(1): 37-40; 1976. (26 references)

The effect of sublethal doses of the organophosphorus compound, Neguvon (trichlorfon), was studied, using normal sheep as the experimental animals. Twenty five sheep aged 6 to 8 mo were given 150 mg/kg Neguvon po. Another dose of 200 mg/kg was given po after 1 mo. No significant changes in serum total proteins were noted. Serum GOT of the intoxicated sheep showed a significant rise as compared with controls. However, serum GPT activity was inhibited and then returned to a normal level. An increase in the levels of bilirubin and disturbed blood glucose levels was also noted. These findings indicate a harmful effect of the drug on liver tissues.

78-2693. Hollinger, M. A.; Zuckermann, J. E.; Giri, S. N. (Dep. Pharmacol., Sch. Med., Univ. California, Davis, CA 95616) **Effect of acute and chronic paraquat on rat lung collagen content.** *Res. Commun. Chem. Pathol. Pharmacol.* 21(2): 295-306; 1978. (15 references)

Paraquat effects on rat lung collagen were evaluated with the aim of using the same as a model for the study of antifibrotic agents in pulmonary fibrosis. Following paraquat administration there was increased *in vitro* lung collagen synthesis within the first few days. However, due to animal variability in response, a dose which was sufficient to cause pulmonary damage in most, also produced a high number of fatalities. Only a small range of doses existed which were adequate enough to produce lung damage and not death. Therefore, multiple injections of low doses appeared to be needed. For these reasons it was determined that paraquat was not an ideal agent for the production of pulmonary fibrosis.

78-2694. Rossouw, D. J.; Engelbrecht, F. M. (MCR Lung Metab. Res. Group, Dep. Physiol., Univ. Stellenbosch, Tygerberg, South Africa) **The influence of paraquat on the *in-vitro* oxygen consumption of rabbit lung.** *S. Afr. Med. J.* 54(5): 199-201; 1978. (20 references)

To study the effects of paraquat on the aerobic metabolism of rabbit lung slices, the oxygen consumption of the slices was measured at different oxygen tensions in the presence or absence of glucose as substrate in a Krebs-Ringer phosphate medium. The oxygen consumption in air of lung slices with or without 10 m*M* glucose in the medium was almost the same at all intervals, but in 100% oxygen phase with glucose, there was a rapid increase in oxygen utilization which lasted 2 hr, and then decreased. Paraquat caused an increase in oxygen consumption of lung slices when glucose was in the medium. The secondary inhibitory effect of paraquat seemed to be unaffected by the presence or absence of glucose. The results showed that oxygen potentiates the effects of paraquat in the lung.

78-2695. Dikshith, T. S. S.; Datta, K. K.; Kushwah, H. S.; Raizada, R. B. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Histopathological and biochemical changes in guinea pigs after repeated dermal exposure to benzene hexachloride.** *Toxicology* 10(1): 55-66; 1978. (23 references)

Toxicity of benzene hexachloride (BHC) was tested in male guinea pigs by correlaating biochemical and histological changes. Daily doses of 100, 200 or 500 mg/kg given dermally to groups of 24 animals each for a total period of 30 days caused significant changes. Animals exposed to high doses died within 5-12 days. Pathological changes in animals exposed to all doses included massive congestion and thickened blood vessels in the liver and mild to severe pathologic lesions in the testes. No changes were seen in the epididymis, kidney, spleen, brain or lungs. The changes in the skin were mild and no signs of dermatitis were seen in the areas painted with BHC. The activity of glutamic oxaloacetic transaminase increased significantly in serum and liver after 7 and 15 days of exposure. The activities of glutamic pyruvic transaminase and alkaline phosphatase were comparable to those of controls after 7 days of treatment. There were, however, increases in their activities after 15 days. Absence of any significant changes in the activities of the enzymes in the liver after 30 days indicated an adaptive compensatory mechanism. The pathological and biochemical changes in the absence of mortality indicated a great need for caution and judicious use by occupational workers handling BHC in fields or in factories.

78-2696. Schumann, A. M.; Borzelleca, J. F. (Dep. Pharamcol., Med. Coll. Virginia, Health Sci. Div., Virginia Commonwealth Univ., Richmond, VA 23298) **An assessment of the methemoglobin and Heinz body-inducing capacity of pentachloronitrobenzene in the cat.** *Toxicol. Appl. Pharmacol.* 44(3): 523-529; 1978. (17 references)

All studies utilized technical grade pentachloronitrobenzene (PCNB) dissolved in corn oil, administered orally to adult cats. Methemoglobin concentrations were significantly elevated from a preadministration concentration of 1 to 11, 10, and 7%, 24, 48, and 72 hr, respectively, following 1600 mg/kg of PCNB. There was approximately an eightfold increase in the number of circulating erythrocytes containing Heinz bodies, so that by 72 hr 52% of those erythrocytes observed contained at least one Heinz body. The intravenous administration of methylene blue (2 mg/kg) 48 hr after PCNB (1600 mg/kg) produced a significant decrease in methemoglobin concentrations from 14 to 4% in 1 hr. Increasing the dose of PCNB to 2400 mg/kg failed to produce a significant increase in methemoglobin concentrations or Heinz body formation from preadministration concentrations. This was presumably due to erratic absorption by the gut, caused by the cathartic effect of the large volume of corn oil vehicle required. Whereas PCNB does not appear to be as potent as sodium nitrite in generating methemoglobinemia, the duration of action is markedly longer [less than 24 hr for sodium nitrite (30 mg/kg) and greater than 72 hr with 1600 mg/kg PCNB]. The methemoglobinemia produced is reversed by methylene blue. (Author abstract by permission)

78-2697. Courtney, K. D.; Ebron, M. T.; Tucker, A. W. (Health Effects Res. Lab., Exp. Biol. Div., US EPA, Research Triangle Park, NC 27711) **Distribution of 2,4,5-trichloro phenoxyacetic acid in the mouse fetus.** *Toxicol. Lett.* 1(2): 103-108; 1977. (8 references)

Autoradiography was used to study the distribution of 2,4,5-T in the organs of fetal CD-1 mice whose mothers had been treated orally with 2,4,5-T (100 mg/kg) on day 13, or daily on days 10-13 of gestation. The peak concentrations of pesticide in the maternal serum and tissues, fetuses, and placentas were observed 8 hr after a single dose. Four daily doses increased the maternal serum levels more than 10-fold and the liver, spleen, kidney, heart, and uterus levels 2-3-fold; the concentrations in the skeletal muscle were similar after one or four doses. The concentrations of pesticide in the fetuses after four doses were 2-fold higher than after one dose. Thirty min after dosing, the pesticide concentrations in the fetus were highest in the liver, eye, and ventricles. At 2 hr, 2,4,5-T was found in most tissues, with the highest concentrations appearing in the internal organs. The concentrations in the liver and brain increased markedly by 8 hr. By 48 hr, 2,4,5-T was still detectable, but at reduced levels. There was a slow turnover of 2,4,5-T in the skin and no deposition of the compound in the palate 8 hr after treatment. The mice excreted 52% of the total dose in the urine at 24 and 48 hr; only 2,4,5-T was recovered from the urine.

78-2698. Willhite, C.; Sharma, R. P. (Toxicol. Program, Utah State Univ., Logan, UT) **Acute dieldrin exposure in relation to brain monoamine oxidase activity and concentration of brain serotonin and 5-hydroxyindoleacetic acid.** *Toxicol. Lett.* 2(2): 71-75; 1978. (11 references)

Acute sublethal exposure to dieldrin was studied to determine whether this would be capable of changing *in vivo* whole brain 5-HT and 5-HIAA concentrations as well as changing brain monoamine oxidase (MAO) activity in various rainbow trout, white leghorn chickens and golden hamsters. At 10 mg/kg dieldrin, the serotonin content was increased to the maximum. In the chicken and hamster, brain MAO activity was significantly decreased. However, this enzyme activity remained unaffected in trout. MAO inhibition was reflected in the 5-HIAA content which also indicated interference with 5-HIAA transport from the brain. The results of this study suggest that MAO inhibition alone is not responsible for changes in 5-HT metabolism which occur following dieldrin exposure. It is suggested that MAO inhibition may result from a disruption of membranes associated with this enzyme.

78-2699. Mayer, F. L.; Mehrle, P. M. (Patuxent Wild. Res. Cen., US Fish & Wildl. Serv., Laurel, MD) **Toxicological aspects of toxaphene in fish: a summary** *Trans. North Am. Wild. Nat. Resour. Conf.* 42: 365-373; 1977. (19 references)

Brook trout, fathead minnows and channel catfish were continuous exposed to toxaphene in water. Growth of adult brook trout was significantly reduced in the 502 ng/l concentration after 3 mo exposure, and in both the 288 and 502 ng/l concentration after 6 mo. The numbers of eggs spawned by brook trout, and egg viability were inversely related to toxaphene concentrations. Eggs later died at the eyed stage due to a bacterial growth, and additional eyed eggs were exposed to toxaphene for 22 days before hatching. No effect on hatching was noted. Effects on reproduction were not noted in fathead minnows, but in channel catfish the time between pairing and spawning was increased, and the amount of gelatinous matrix surrounding the eggs was reduced. Growth and survival of brook trout fry were reduced by toxaphene concentrations of 39 ng/l. Survival of fathead minnow fry was reduced only in the 97 ng/l exposure, but the no-effect concentration for growth was below 54 ng/l. Channel catfish fry survival and growth were reduced in the 299 and 630 ng/l concentrations. Toxaphene also caused reduced collagen synthesis and increased mineralization in the backbones of fish. Whole body residues of toxaphene in brook trout, fathead minnows, and channel catfish were within the range of those reported by the National Pesticide Monitoring Program.

78-2700. Abbasov, T. G. (Author address not given) **Ostatochnye kolichestva khlorofosa i TCM-3 v yaitsakh, organakh i tkanyakh kur pri naruzhnoi obrabotke. [Trichlorfon and TCM-3 Residues in eggs, organs and tissues of chicken after external treatment.]** *Tr. Vses. Nauchno-Issled. Inst. Vet. Sanit.* 52: 142-148; 1976. (Russian)

The toxicity of organophosphorus pesticides trichlorfon (TCF) and TCM-3 was studied in adult chickens. Spraying of chicken with 1, 2, 4, 6 and 8% TCF solution or TCM-3 emulsion resulted in marked, dose-dependent inhibition of serum cholinesterase activity. Pesticides could be detected within 5 days after exposure in eggs from hens treated with 6-8% TCF and 25-40 days after exposure in eggs from hens treated with 1-8% emulsion of TCM-3. TCF could be detected in tissues and organs of exposed chicken from up to 5-15 days at levels of 0.01-0.2 mg/kg, and TCM-3 could be detected up to 30-60 days at levels of 0.01-2.5 mg/kg.

78-2701. Marselos, M.; Torronen, R.; Aitio, A. (Dep. Physiol., Univ. Kuopio, Kuopio SF-70101, Finalnd) **Responses of the *D*-glucuronic acid pathway in rat tissues to treatment with tetrachlorodibenzo dioxin.** *Xenobiotica* 8(7): 397-402; 1978. (35 references)

2,3,7,8-Tetrachlorodibenzo-*p* -dioxin (TCDD) was administered to rats to study its effects on the enzyme activities of the *D*-glucuronic acid pathway in the liver, small intestine and kidney. The UDP-glucuronosyl transferase activity of male albino rats given TCDD (80 μg/kg, one dose ip) 6 days before killing was significantly increased in all tissues examined, and UDP-glucuronic acid pyrophosphatase activity was markedly decreased in the liver. *D*-Glucuronolactone and *L*-gulonate dehydrogenase activity in the liver and small intestine were slightly decreased after TCDD treatment. The activity of UDP-glucose dehydrogenase and β-glucuronidase were unchanged. The 24 hr urinary excretion of *L*-ascorbic acid was enhanced 8-fold, although no difference was detected in the excretion of D-glucaric acid between the control and experimental animals. These results suggest an increased capacity for glucuronide conjugation after treatment with TCDD. The lack of increase in the urinary excretion of *D* -glucaric acid further challenges its use as a reliable indicator

of enahnced drug metabolism. (Author abstract by permission)

78-2702. Das, B.; Singh, P. K. (Lab. Algol. Cent. Rice Res. Inst., Cuttack 753006, India) **Pesticide (hexachlorocyclohexane) inhibition of growth and nitrogen fixation in blue-gree algae *Anabaenopis raciborskii* and *Anabaena aphanizomenoides* Z. *Allg. Mikrobiol* 18(3): 161-167; 1978.** (23 references)

Because of the importance of primary producers in the food chain, the inhibition of growth and nitrogen fixation in the blue-green algae *Anabaenopsis raciborskii* and *Anabaena aphanizomenoides* by BHC (hexachloro cyclohexane) was studied. When the alage were treated with 10 μg/ml of BHC, there was an inhibition in growth; a concentration of 60 μg/ml of BHC proved to be lethal. The intermediate concentrations of 20, 30, 40, and 50 μg/ml caused a progressive decline in growth. The nitrogen fixing ability of the algae was found to be decreased by BHC. Large initial populations of the algae showed a greater tolerance towards BHC than did small initial populations.

78-2703. Nehez, M.; Selypes, A.; Paldy, A.; Schroeter, C. S. (Inst. fuer Hyg. & Epidemiol., Med. Univ. Szeged, Szeged, Hungary) **Mutagene Wirkung eines dinitro-*o*- kresol-haltigen Pflanzenschutzmittels. [The mutagenic action of a dinitro-*o*- cresol-containing plant protective.]** *Z. Gesamte Hyg. Ihre Grenzgeb.* 24(1): 20-24; 1978. (30 references) (German)

The question of mutagenicity of the pesticide and herbicide DNOC (dinitro-*o*- cresol) was studied by determination of its effects on human lymphocytes *in vitro*, on bone marrow cells of mice *in vivo*, and by performing a chromosomal analysis of a patient intoxicated by DNOC. Cultures of human lymphocytes *in vitro* treated with 0.02 μg, 0.2 μg, and 2 μg/ml DNOC exhibited 56.5% aberrant cells with the percentage increasing with the DNOC concentration (control cultures exhibited 2.5% defective chromsomes.) Exposure of bone marrow cells of mice to DNOC resulted in a predominance of chromosomal aberrations. Analysis of chromosomes from a patient suffering from DNOC poisoning resulted in a 3.09% level of aberrant chrosomes, which is at the upper limit of normal and does not exclude the possiblility of mutagenic action of DNOC *in vivo*. For humans, the maximum permissible DNOC vapor concentration in the atmosphere is 0.1 mg/m^3. A blood level exceeding 40 μg/ml is a symptom of poisoning.

78-2704. Malkomes, H. P. (Inst. Unkrautforsch. Biol., Bundesanst. Land & Forstwirtsch., D-3300 Braunschweig, Germany) **Verhalten der Bodenmikroflora nach Anwendung des Herbizids Venzar (Lenacil) zu Zuckerrueben. [Behavior of the soil microflora after application of the herbicide Venzar (lenacil) to sugar beets.]** *Z. Pflanzenkr. Pflanzenschutz* 84(9): 516-525; 1977. (23 references) (German)

Venzar (lenacil) was applied in spring to sugar beets planted in three different soil types. The application rates of 1.1-3.6 kg/ha were selected in preliminary experiments for optimal herbicidal efficacy and crop tolerance. The activity and composition of the soil microflora were investigated in the autumn of the first year and in the summer and autumn of the following year. Negative effects were found in the first year on aerobic gram-negative bacteria, algae, and fungi. The degree of these effects varied with the soil type. Other microbial classes were stimulated, sometimes intensively, especially in the year after treatment. The cellulose degrading and dehydrogenase activity were generally increased. A slight reduction in cellulose decomposition was found in only one soil, which had a high humus content.

78-2705. Frey, F.; Wilcke, D. E. (Inst. Pflanzenkr., Rheinischen Friedrich Wilhelms Univ., D-5300 Bonn, Germany) **Untersuchungen ueber Nebenwirkungen zweier Herbizidpraeparate auf bodenbowohende Nematoden in einer Obstanlage. [Studies on the side effects of two herbicide preparations on the soil-inhabiting nematodes in an orchard.]** *Z. Pflanzenkr. Pflanzenschutz* 85(1): 1-9; 1978. (25 references) (German)

The side effects of two soil herbicides, Domatol (39% simazine + 19% amitrole) and Ustinex PA (30% amitrole + 50% diuron) were investigated on the soil nematode fauna of an apple orchard over a 3-yr period. No significant differences in soil nematode numbers or species were found between herbicide-treated and untreated plots in the first year of treatment. However, the total number of nematodes was significantly reduced in treated plots in the second and third years of herbicide application. The greatest reduction was detected in plots treated with high doses of Ustinex PA. The changes detected were basically due to reductions in the population levels of the bacteriophagous nematodes, which represented the greater portion of the total nematode population. Phytophagous nematode populations were greatly decreased in all herbicide treated plots. Levels of mycophagous nematodes increased significantly in all herbicide treated plots except those with high doses of Ustinex PA.

78-2706. Erber, M.; Hollatz, R.; Tempel, K. (Inst. Pharmacol. Toxicol. & Pharm., Univ. Muenchen, Munich, Germany) **Induction by phenobarbital of aniline-*p*- hydroixylase in mouse liver under the influence of X-irradiation and 2,4,6-triethylene- imino- 1,3,5- triazine.** *Zentralbl. Veterinaermed. Reihe A* 24(10): 848-855; 1977. (36 references)

Following the administration of 100 mg phenobarbital (PB)/kg to female mice of a NMRI inbred strain, the activity of microsomal aniline-*p*- hydroxylase (AH) was elevated in a statistically significant number as early as 16 hr. Maximum induction was reached in 24 to 48 hr. PB induced activity of AH in livers was enhanced additionally when the animals were X-irradiated 4 to 16 hr before administratino of PB. The same effect could be demonstrated after repeated irradiations with low doses. The induction of AH was inhibited by 2,4,6-triethylene imino-1,3,5- triazine (tretamine) only when administered in extremely high doses. Lower doses resulted in superinduction.

78-2707. Rejniak, L.; Siuda, S.; Winnicka, M. M. (Inst. Biostructure., Dep. Histol. & Embryol., Med. Acad., Bialystok, Poland) **Effect of foschlor on the thyroid gland of white rat.** 26(2): 261-269; 1977. (32 references)

Foschlor (trichlorfon) was administered po in doses of 250, 100, and 50 mg/kg to white rats and the effects on the thyroid gland were observed. Morphological examination revealed damage to the gland, regressive changes, and changes in the intensity of the TPPase and acid phosphatase reactions in the animals receiving the large doses of the insecticide. The thyroid glands of animals receiving small characteristic of hyperthyroidism.

See also 78-2509, 78-2531, *and* 78-2547.

78-2708. Jacobson, M. (Biol. Act. Nat. Prod. Lab., ARS, USDA, Beltsville, MD 20705) **Isolation and identification of toxic agents from plants.** *ACS Symp. Ser.* 62: 153-164; 1977. (58 references)

The most generally useful methods for the isolation and identification of the following pesticidal toxicants from plants are reviewed: pyrethrum, rotenoids, nicotine and nicotinoids, other well-known alkaloids such as those from *Veratrum*, unsaturated isobutylamides, bitter substances (especially insect feeding deterrents), fungal peptides, gossypol, microtoxins, and insect growth regulators. Additional information for each of the following methods is also provided: thin-layer chromatography, high-performance liquid chromatography, infrared spectroscopy, NMR spectroscopy, and mass spectrometry.

78-2709. Kaminski, F.; Melcher, R. G. (Michigan Div. Anal. Lab., Dow Chem. Co., Midland, MI 48640) **Collection and determination of trace amounts of organo-thiophosphates in air using XAD-2 resin.** *Am. Ind. Hyg. Assoc. J.* 39(8): 678-683; 1978. (9 references)

A method has been developed and validated for the collection of *o,o*-dimethyl phosphorochlor idothioate (DMPCT), *o,o*-diethyl phosphorochlor idothioate (DEPCT), and monoethyl phosphorodichlorodo thioate (MEPCT) in air and their determination by gas chromatography using a flame photometric detector specific for phosphorous. XAD-2 resin is used for the collection of these reactive organo-thiophosphates for periods up to eight hours. Although these compounds tend to hydrolyze in humid air, sorption on the resin tends to stabilize the compounds and reproducible recoveries are obtained even after seven day sample storage. (Author abstract by permission)

78-2710. Nangniot, P.; Zenon-Roland, L.; Berlemont-Frennet, M. (Fac. Sci. Agron. 5800 Gembloux B-5800, Belgium) **Dosage simultane de residus de tetramethylene thiurame disulfure (TMTD) at d'ethylene- bis-dithiocarbamates (zineb, maneb) par polarographie. [Simultaneous determination of tetramethylene thiuram disulfurated (TMTD) and of ethylene- bis- dithiocarbamates (zineb, maneb) residues by polarography.]** *Analusis* 6(6): 273-275; 1978. (5 references) (French)

A new polarographic method for the simultaneous determination of tetramethyl thiuram disulfide (TMTD) and ethylene- bis- dithiocarbamate residues is described which can be used advantageously if the concentrations of the two compounds are not too far apart. The compounds are adsorbed on a hanging mercury drop electrode with a solution of 0.4 *M* NaOH/0.2 *M* Na_2EDTA serving as an extraction solvent. The insoluble mercury salt of ethylene- bis- dithiocarbamate yields an anodic diffusion curve. TMTD splits in an alkaline medium yielding a molecule of sodium dimethyl dithiocarbamate, which also gives an anodic diffusion curve. The ΔE 0.5 of 120 mV formed between the two compounds accounts for the separation. The procedure takes about 10 min, requires neither isolation nor purification and can be used within a concentration range of 0.05-1 μg of active substance per ml. Differential impulse polarography is unsuitable for the above purpose because the peaks are not reproducible.

78-2711. Farrow, J. E.; Hoodless, R. A.; Sargent, M.; Sidwell, J. A. (Dep. Ind., Lab. Gov. Chem., London, England) **Fungicide residues. Part VI. Determination of residues of post-harvest fungicides on citrus fruit by high-performance liquid chromatography.** *Analyst (London)* 102(1219): 752-758; 1977. (21 references)

A high-performance liquid chromatographic method for the determination of residues of biphenyl, benomyl, carbendazim, 2-phenylphenol, and thiabendazole on citrus fruit is presented. A sample of peel, fruit pulp, or whole fruit is refluxed with dilute acid. Biphenyl and 2-phenylphenol are steam distilled and trapped for determination by liquid chromatography, while the benzimidaolze fungicides remain in the acidic residue. This acidic residue solution is subjected to a simple solvent extraction and clean-up prior to determination of the fungicides by liquid chromatography. The liquid chromatographic systems used are an improvement on those previously reported. All compounds of interest can be separated rapidly, and can be determined at levels considerably lower than those required for routine screening of citrus fruit in compliance with statutory limits. No problems have been experienced with interfering co-extractive peaks. Percent recoveries from spiked samples ranged from 57% for 2-phenylphenol to 88% for thiabendazole on orange peel, from 68% for 2-phenylphenol to 102% for biphenyl on lemon peel, and from 32% for thiophanate-methyl to 96% for biphenyl on grapefruit peel.

78-2712. Smart, N. A.; Hill, A. R. C.; Roughan, P. A. (Plant Pathol. Lab., Minist. Agric. Fish. & Food, Harpenden, Hertfordshire, England) **Comparison of methods for the determination of residues of organophoshorus pesticides in samples having incurred residues.** *Analyst (London)* 103(1228): 770-772; 1978. (10 references)

Malathion, dimethoate, and omethoate formulations were applied to growing lettuces; a chlorfenvinphos formulation was applied to cabbages; and a parathion formulation to tomatoes, in order to compare various methods of organophosphorus residue determination. Five replicate determinations were carried out for each crop-pesticide combination. Determinations were done by the Abbott *et al* method, the Sissons and Telling method, and the Storherr and Watts sweep co-distillation method. There was no significant difference between the methods in all crops and pesticides tested. Sweep co-distillation tended to give a lower result, making this method unsuitable for compounds as polar as omethoate. There was interaction between methods and detectors for all pesticides except parathion.

78-2713. Somorin, O. (Chem. Dep., Univ. Lagos, Lagos, Nigeria) **Cholinesterase assay by gas-solid chromatography.** *Anal. Biochem.* 88(2): 442-448; 1978. (17 references)

A modified gas chromatographic technique suitable for accurate determination of cholinesterase activity in blood serum is described. The method is based on the hydrolysis of butyrylcholine chloride, solvent extraction, and the quantitative estimation of the hydrolytic product, butyric acid, by gas-solid chromatography. With this procedure, optimum pH and buffer conditions for cholinesterase activity were pH 8.0, and 0.05 *M* tris-HCl. Cholinesterase activities in blood samples from healthy subjects, as determined, were in the range of normal values as reported in the literature. Effects of organophosphate E 600 and other drugs on the cholinesterase activity were also noted. The determination of butyric acid at levels down to 1 μg/ml are possible marking this method useful as a serum cholinesterase assay.

78-2714. Lowry, J. H.; Smart, R. B.; Mancy, K. H. (Dep. Environ. & Ind. Health, Environ. Chem. Lab., Univ. Michigan, Ann Arbor, MI 48109) **Differential pulse polarography of phenylarsine oxide.** *Anal. Chem.* 50(9): 1303-1309; 1978. (25 references)

Differential pulse polarography was applied to analyze for phenylarsine oxide (PAO) in aqueous solutions at different pH values. Optimization of the instrumental artifacts resulted in a detection limit of 10^{-8} *M* PAO at pH 7.3, a relative standard deviation of 1.7%, and a maximum sensitivity of 450 μA/m*M* PAO. The polarographic reduction of phenylarsine oxide was found to be pH dependent. Cyclic voltammetry and coulometry were used to characterize the electrode process. (Author abstract reprinted by permission of the American Chemical Society)

78-2715. McCown, S. M.; Land, H. H.; Earnest, C. M.* (Dep. Chem., Northeast Louisiana Univ., Monroe, LA 71209) **Algorithm for recognition and quantitation of chromatograms of a pesticide mixture by a microprocessor-based integrator.** *Anal. Chem.* 50(9): 1362-1366; 1978. (14 references)

Strobane is a pesticide mixture consisting of polychlorinated terpenoids which contain about 70% chlorine by weight. Some 250 compounds have been identified from the mixture, using capillary GC/MS systems. An algorithm is proposed whereby chromatograms of the pesticide Strobane may be recognized and quantitated by automatic data-handling devices. The method is suitable for adaptation to the chromatographic analysis of any mixture whose chromatogram is known to contain a recognizable, reproducible pattern of retention times and peak intensities. A new concept, relative valley intensity, is introduced and its use is demonstrated. (Author abstract reprinted by permission of the American Chemical Society)

78-2716. Clocan, N.; Baiulescu, G. E.* (Cent. Lab. Pestic. Control, Bucharest 72964, Romania.) **Potentiometric determination of phenoxyalkyl carboxylic acids in pesticides.** *Anal. Chem.* 50(9): 1407-1408; 1978. (6 references)

A method for the potentiometric determination of phenoxyalkyl carboxylic acids in pesticides is described. The method is based on the fact that phenoxyalkyl carboxylic acids react with mercury ions giving insoluble precipitates. The determination of mercurous mercury contained in the precipitate leads to the evaluation of the concentration of phenoxyalkyl carboxylic acids in the sample. Because of its selectivity, the method is applicable to the analysis of a wide range of herbicides containing phenoxyalkyl carboxylic acids alone or in a mixture with other acidic organic compounds extractable in diethyl ether. The method is useful for establishing the quality of commercial products containing phenoxyalkyl carboxylic acids.

78-2717. Hass, J. R.; Friesen, M. D.; Harvan, D. J.; Parker, C. E. (Environ. Biol. & Chem. Branch, Natl. Inst. Environ. Health Sci., Research Triangle Park, NC 27709) **Determination of polychlorinated dibenzo-*p*-dioxins in biological samples by negative chemical ionization mass spectrometry.** *Anal. Chem.* 50(11): 1474-1479; 1978. (27 references)

Methane positive chemical ionization and electron impact are found to be as much as 1000-fold less sensitive than methane negative chemical ionization for the detection of polychloro dibenzo-*p*- dioxins. The use of oxygen with or without methane results in somewhat decreased sensitivity and increased specificity for these compounds. The application of methane negative chemical ionization mass spectrometry for the determination of dioxins in tissue and wood is discussed. (Author abstract reprinted by permission of the American Chemical Socieity)

78-2718. Terce, M.; Calvet, R. (Stn. Sci. Sol, Cent. Natl. Rech. Agron., INRA, 78000 Versailles, France) **Determination par spectroscopie UV de la quantite d'herbicide contenue dans un extrait aqueux de sol. Application a l'etude de l'adsorption. [Determination of the amount of herbicide contained in a soil aqueous extract by UV spectroscopy.]** *Ann. Agron.* 28(6): 661-670; 1977. (French)

The sensitivity of two methods for determining the amounts of herbicides, terbutryne, Biuron and napropamide, contained in aqueous soil extracts by UV spectroscopy were compared. Spectroscopic analysis can be used either directly on the aqueous soil solution, or following extraction of the compound by organic solvent. Spectroscopic analysis can be used when the herbicide molecule possesses absorption bands of sufficient intensity and has not undergone a chemical transformation. Chloroform is used as the extractant, the solution is evaporated, the crystalline herbicide is redissolved in methanol, and this solution is subjected to spectroscopic analysis. The study revealed that for soils containing little organic matter (organic carbon content less than 1%) the accuracy of the two methods is comparable. In the case of soils containing more than 1% organic matter the extraction method yields less scattered results.

78-2719. Dreze, P. (Fac. Sci. Agron., B-5800 Gembloux, Belgium) **Analyse de residus et de metabolites de pesticides**

au moyen de molecules marquees. [Analysis of pesticide residues and metabolites using labeled molecule.] *Ann. Gembloux* 82(2): 67-70; 1976. (4 references) (French)

The possibilities that radioactive labeling, ^{14}C, ^{3}H, ^{32}P, ^{36}Cl and ^{35}S, offers in the qualitative and quantitative determination of pesticides are highlighted in two examples. The first involves the widely used fungicide propineb (zinc propylenebis- dithiocarbamate) used to protect agricultural crops and fruit trees from mildew. Apples which have been sprayed with ^{14}C-labeled fungicide are extracted by maceration in 3 different baths (methanol, water, EDTA) and total radioactivity is measured by the liquid scintillation method. The alcoholic extract, in which the metabolites are concentrated, is subjected to qualitative thin-layer chromatography. Using this method it was found that, following treatment, the residue is 3 to 5 ppm, and 42 days later drops to 0.22 ppm. Further, separation of the skin from pulp disclosed that, 22 days following treatment, 30 to 40% of the total residue has penetrated into the fruit. The second example involves tetramethyl thiuram disulfide (TMTD) labeled with ^{35}S. The radiometric method disclosed that the total residue on apples after 4 consecutive treatments with TMTD was below 2 μ g/g.

78-2720. Busch, K. L.; Bursey, M. M.; Hass, J. R.; Sovocool, G. W. (Dep. Chem., Univ. North Carolina, Chapel Hill, NC 27514) **Comparison of five ionization methods for producing mass spectra of typical organophosphorus pesticides.** *Appl. Spectrosc.* 32(4): 388-399; 1978. (12 references)

Conventional electron impact and methane chemical ionization were used to obtain positive ion mass spectra of 16 typical organophosphorus pesticides. These results were compared with the negative ion mass spectra obtained using methane, a methane-oxygen mixture, and oxygen as enhancement/ reagent gases. Chemicals included in the study were monocrotophos, dicrotophos, mevinphos, ronnel, bromophos, dichlofenthion, Dursban (chlorpyrifos), ethyl parathion, phosvel (leptophos), EPN, dimethoate, malathion, azinphos-methyl, phorate, azinophos-ethyl, and carbophenothion. Phosphate anions and phenate anions characterize the gas-enhanced negative ionization mass spectra. The phenate anions dominate in many cases, and it is suggested that it would be possible to monitor hydrolysis of many of these compounds by watching the phenate ion alone. A migration of the *R* group from *O* to *S* was demonstrated by several *O*-aryl compounds before fragmentation. The sensitivity of negative ionization techniques is much greater than that of positive ionization for the compounds tested. As little as 75 fmol of the most intense ion in the spectrum may be detected.

78-2721. Petrocelli Vasques, R. M. P.; Yoneda, H. (Inst. Biol., Sao Paulo, SP, Brazil) **Separacao e analise do chlorpyrifos LVC. [Separation and analysis of chlorpyrifos LVC.]** *Arq. Inst. Biol. (Sao Paulo)* 43(1-2): 31-32; 1976. (6 references) (Portuguese)

Chlorpyrifos is a popular pesticide for treatment of cotton crops in Brazil. As preparation for gas chromatography over a solid phase of 2.5% SE-30 plus 0.25% Epon 1001, it was first found necessary to remove two impurities by column chromatography. The efficiency of this cleanup operation was measured in 5 tests, with results varying from 99% to 101.0%. Gas chromatography results coincided with the stated formula, with a variation coefficient of 1.049.

78-2722. Almeida, J. B.; Piedade, J. R.; Silva, L. P. (Dep. Chem., Inst. Biol., Sao Paulo, SP, Brazil) **Analise dos defensivos nitro por potenciografia. [Analysis of nitro pesticides by means of potentiography.]** *Arq. Inst. Biol. (Sao Paulo)* 43(3-4): 89-91; 1976. (6 references) (Portuguese)

Pesticides containing nitro compounds were quantitatively analyzed by an amperometric type of potentiography. The nitro groups were converted to amines then quantitatively determined with a 0.1 *M* $NaNO_2$ solution, using amperometric titration. The method was tested on two PCNB formulas, binapacryl, Sumithion (fenitrothion) and parathion. Reagents used included hydrochloric and acetic acids, powdered zinc and NaBr.

78-2723. Piedade, J. R.; Almeida, J. B. (Inst. Biol., Sao Paulo, Brazil) **Determinacao potenciografica dos defensivos organoclorados. [Potentiographic determination of chlorinated organic pesticides].** *Arq. Inst. Biol. (Sao Paulo)* 43(3-4): 141-143; 1976. (6 references) (Portuguese)

The lack of precision caused by the interference of diluents in the electrochemical determination of chlorine in chlorinated organic pesticides motived the development of this new method of potentiometric titration. The standard formulations used were: 2,4-D amine (solution); dalapon (soluble powder); emulsifiable concentrations of 2,4-D ester and 2,4-D and Magtac (soluble powder). A sample containing approximately 0.035 g chlorine was weighed and quantitatively transferred to a 200-ml flask, to which was added 3 ml dioxan, 6 ml monoethanolamine, and 1 g metallic sodium. The flask was quickly attached to a Liebig condenser, heated slightly until cessation of the initial violent reaction, and then subjected to mild reflux for 30 min, with frequent agitation. After cooling, the excess sodium was destroyed by gradual addition of water, so as to wash the condenser until the volume reamining in the flask was 100 ml. Potentiographic titration was then effected with 0.1 *N* $AgNO_3$, after quantitative transfer to a 500-ml beaker. Analyzed chlorine contents yielded standard deviations from the mean of less than 1%, which indicates the precision of the analytic technique, and shows that the method is not subject to interference from the diluents. Although the reason for this non-interference is not known, it is presumably due to the reduction medium, which as employed for the first time by the authors.

78-2724. Goodson, L. H.; Jacobs, W. B. (Midwest Res. Inst., Kansas City, MO 64110) **Immobilized enzymes for detection and monitoring of organophosphates and carbamates. Chapter 28.** In: *Biomedical Applications of Immobilized En-*

zymes and Proteins. Chang, T. M. S., ed. (New York: Plenum): 2: 55-69; 1977. (10 references)

The possibility of using immobilized enzymes for the detection and monitoring of anticholinesterase materials in air and water on a real-time basis is presented. The method also provides sensitivity and specificity not radily achieved by other methods. The relationship of enzyme inhibition to toxicity of the substance detected is well established. The continuous aqueous monitor was specificially designed for detection of pesticides in water supplies after pesticide spills. Preliminary experiments with air monitoring demonstrate that the sensor is able to detect pesticides at levels that do not cause toxic symptoms in workers exposed for 8 hr periods. The air monitor has, in several cases, provided rapid warning of mechanical failures in ventilating systems, and has also shown the effect of specific manufacturing operations on the ambient level of pesticides in the air.

78-2725. Eichner, M. (Chem. Landesuntersuchungsanst., Offenburg, Germany) **Pestizide und Rueckstandsanalytik. [Pesticides and residue analysis.]** *Chem. Labor. Betr.* 28(8): 299-302; 1977. (11 references) (German)

Pesticides are applied in considerable quantities throughout the world to reduce crop losses due to pest infestations. Government authorities at various levels are charged with the responsibility of monitoring pesticide residue levels on crops. The most efficient, economical, and reliable methods of analysis are primarily multiresidue methods, including the AOAC method; the Becker method for organochlorines and organophosphates, which is commonly used in Germany, and the Thier method for some herbicide groups. The use of sweep co-distillation has offered further improvements in efficiency, especially with the use of automated equipment. Within the past 2 yr the State Chemical Analysis Institute at Offenburg has co-nducted analyses by the sweep codistillation method for 42 organophosphorus compounds in 20 varieties of fruits and vegetables and 35 organochlorines in 22 different substrates. Recovery rates of 80-100% were achieved in 90% of the cases investigated, and recovery rates of 60-80% were achieved in the remainder. If automated extraction methods are also employed, the possibility of fully automatic pesticide residue analysis seems within reach.

78-2726. Kotzias, D.; Lahaniatis, E.; Bieniek, D.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen. & Umweltforsch., D-8042 Neuberberg, Germany) **Nebenprodukte im kaeuflichen Pentachlornitrobenzol. [Byproducts in commercial PCNB.]** *Chemosphere* 7(6): 503-507; 1978. (5 references) (German)

Two samples of technical PCNB of different origin (the first prepared by nitration of pentachlorobenzene with fuming nitric acid, the second by chlorinating nitrobenzene with chlorosulfonic acid and iodine as catalyst) were analyzed to identify the by-products they contain. Column chromatography was used to separate and enrich the individual by-products whose qualitative and quantitative determination was subsequently accomplished by gas chromatographic comparison with authentic compounds. The analysis of the nitric acid-prepared and the chlorosulfonic acid-prepared samples yielded the following results: PCNB (92.4 and 91%), and hexachlorobenzene (2.7 and 4.5%), respectively.

78-2727. Hild, J.; Schulte, E.; Thier, H. P. (Inst. Lebensmittelchem., Univ. Muenster, D-4400 Muenster, Germany) **Trennung von Organophosphor-Pestiziden und ihren Metaboliten auf Glaskapillarsaeulen. [Separation of organophosphorus pesticides and their metabolites by glass-capillary gas chromatography.]** *Chromatographia* 11(7): 397-399; 1978. (7 references) (German)

The separation of organophosphorus pesticide residues and their metabolites occurring in the form of oxidation products as ozones, sulfoxides and sulfones of widely different polarities, extracted from spinach by glass capillary gas chromatography using the Type 1400 Varian Aerograph gas chromatograph equipped with a 25 m long glass capillary of 0.3 mm diameter dynamically impregnated with diethylene glycoladipate for good adhesion, is described. No problems were encountered in separating parathion, its ortho-isomers with metabolites, the two demeton isomers with some of their oxidation products, three isomers of chlorthiophos, and their sulfones. Separation is achieved at comparatively low temperature which minimizes decomposition. Peaks of other plant substances simultaneously extracted did not appear until residue concentrations exceeded 0.1 mg/kg. The detection threshold was 0.5 mg/kg.

78-2728. Boidron, J. N.; Boidron, A. M. (Author address not given) **Interet de la demixtion pour l'extraction et le dosage des residus de pesticides. [Extraction and determination of pesticide residues in musts.]** *C. R. Seances Acad. Agric. Fr.* 63(9): 559-563; 1977. (6 references) (French)

A time-saving method of separating (extracting) trace quantities of pesticides from foods based on forcing most of the residue present into a small volume of an organic phase of a ternary system (such as water-alcohol-ammonium sulfate) is demonstrated on the extraction and analysis of dichlofluanide residues in musts. An internal standard (dieldrin) is added to the sample, then immediate phase separation is achieved by the addition of ethanol and ammonium sulfate. The organic phase is dried, purified by chromatography and the eluate is analyzed by gas chromatography by comparing the height of the dichlofluanide peak with that of the internal standard. Separation is not total but the separation factor can be determined by adding a known quantity of dichlofluanide to a sample of uncontaminated must and going through the above procedure. The method is suitable especially of highly water-soluble pesticides and can be adapted for the analysis of other liquid and solid foods.

78-2729. Noack, S.; Reichmuth, Ch.*; El-Lakwah, F. (Biol. Bundesanst. Land & Forstwirtsch., Inst. Vorratsschutz, D-1000 Berlin 33, Germany) **Zur gas-chromatographischen**

Bestimmung von Methylbromid neben Phosphin in Luft. [Determination of methyl bromide in combination with phosphine in air by gas chromatography.] *Fresenius Z. Anal. Chem.* 291(2): 121-123; 1978. (10 references)

The determination of methyl bromide in combination with phosphine in air by gas chromatography is described. For methyl bromide singly, as well as in combination with 1-10 ppm PH_3, a linear relation between peak height and the content of 5-50 ppm CH_3Br for a dosaged gas volume of 1 ml was found. The calibration-curves for the CH_3Br-PH_3 mixtures do not show statistical differences, while the difference to the calibration-curve for methyl bromide only is highly significant. The precision of the determination was 1% for pure methyl bromide and about 2.5% in mixture with PH_3. (Author abstract by permission)

78-2730. Rosen, A. A. (US EPA, Cincinnati, OH) **The foundations of organic pollutant analysis.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 3-14; 1977. (35 references)

Progress made over the past 25 years in the area of organic analysis with regard to pollutants present in water is discussed. Two major scientific advancements occurred during this time which had a bearing on the field. The first was an increased ability to assess the health effects of various pollutants, particularly carcinogens. The second was the continued development of the gas chromatograph which proved so useful in separating organic mixtures. During this time various methods were developed for concentrating organic pollutants from water. These include: liquid-liquid extraction, adsorption on polyurethane foam or polymer beads, collection on macroreticular ion-exchange resins, and volatilization, with subsequent trapping, in solvents or on adsorbents. Work done in the area of carbon filter extracts made it possible to apply a solubility-group separation scheme yielding the following groups of related organic pollutants: amphoteric, basic, acidic, phenolic, and neutral compounds. Contained in the neutral group are aliphatic and aromatic hydrocarbons, chlorinated hydrocarbons, alcohols, esters, aldehydes and ketones. To subdivide the neutral group into fractions as aliphatics, aromatics, and oxygenated compounds, column adsorption chromatography was employed. Most chlorinated hydrocarbon pesticides concentrate in the aromatic fraction where infra-red spectrometry can be used to detect their presence. For the clean-up and separation of chlorinated pesticides for subsequent identification and analysis by infra-red spectrometry, both column partition chrmoatography and thin-layer adsorption chromatography have proven useful. Between 1960 and 1963 efforts were made toward the analysis of chlorinated pesticides in water using gas chromatography, and by this method chlordane was discovered in the water supply at Hawaii Volcanoes National Park.

78-2731. Hutzinger, O.; Sundstrom, G.; Karasek, F. W.; Safe, S. (Lab. Environ. Chem., Univ. Amsterdam, Amsterdam, The Netherlands) **The chemistry of some potential polyhalogenated water pollutants.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 15-33; 1977. (7 references)

Fairly extensive information exists on pesticides, herbicides, and other such chemicals which are released directly into the environment, concerning their toxicity, environmental behavior, and metabolism. In gathering information about chemicals which might be persistent when released into the environment the following points must be considered: chemical and analytical methods for identifying the compound, possible routes of its release to the environment along with mechanisms of distribution after release, behavior of the chemical in the environment, including information on persistence and degradation, and finally, information related to the biological and toxicological effects. The chemistry of four organohalogen compounds is described. One of the four is chlorakylene 12, a suggested PCB-replacement. Chromatographic properties are very similar to those of PCB and DDT-substances. The more destructive of the clean-up procedures for extracts, such as the concentrated sulfuric acid treatment used for PCB, leaves the chloroalkylenes unaffected, but the oxidation procedures, sometimes used for elimination of interferences of PCB and DDT compounds in gas chromatographic analysis, destroy most of the chloralkylene components.

78-2732. Safe, S.; Bunce, N. J.; Chittim, B.; Hutzinger, O.; Ruzo, L. O. (Guelph-Waterloo Cent. Grad. Work Chem., Univ. Guelph, Guelph, Ont., Canada) **Photodecomposition of halogenated aromatic compounds.** In: *Identification and Analysis of Organic Pollutants In Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 35-47; 1977. (32 references)

The photochemical degradation of various halogenated aromatic compounds is discussed as it relates to the eventual destruction of these chemicals persistent in the environment. Photochemical studies on isomeric PCB, PBB, PCN, and PCT are summarized with emphasis on the mechanism of the photochemical degradation and on the identity of the products formed. Photochemical degradation of PCB compounds results in the formation of lower chlorinated PCB isomers which are less toxic, and also the formation of the more toxic chlorinated dibenzofuran and chlorobiphenylol compounds. With regard to the degradation of such halogenated aromatics, photochemical reactions occurring as a result of solar radiation are only of minor importance.

78-2733. Kopfler, F. C.; Melton, R. G.; Lingg, R. D.; Coleman, W. E. (Health Effects Res. Lab., Water Qual. Div., US EPA, Cincinnati, OH) **GC/MS determination of volatiles for the National Organics Reconnaissance Survey (NORS) of drinking water.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 87-104; 1977. (17 references)

The development and use of gas chromatography mass spectroscopy (GC/MS) methods for the collection and

preparation of samples of drinking water is discussed. The water is analyzed for organic chemical content. Details are given regarding sample collection and transportation. Because the chlorination of drinking water results in the formation of halogenated organic compounds in the water, and since drinking water contains a chlorine residual, studies were made to determine whether the concentration of organics could change with time during storage of samples. It was found that the concentrations of the chlorinated compounds increased even when samples were kept chilled. The effect of temperature on the results of qualitative analyses was also investigated. The qualitative procedure developed and used in the National Organics Reconnaissance Survey is outlined. The purging procedure and analytical standards required for quantitative analyses are also discussed.

78-2734. Mieure, J. P.; Mappes, G. W.; Tucker, E. S.; Dietrich, M. W. (Monsanto, Co., St. Louis, MO) **Separation of trace organic compounds from water.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 113-133; 1977. (6 references)

Various isolation procedures used for separating trace organic compounds from water are discussed and their usefulness described. Each of the procedures examined has unique features which facilitate these analyses for specific types of compounds. The use of headspace analysis allows a means for isolating relatively volatile components without the necessity of adding a solvent. The solvent might dilute the components and it might also mask the presence of some chemicals. Use of the membrane mass spectrometry system allows one to combine the isolation, identification, and measurement steps into one rapid and convenient technique. The full potential of membrane selectively to time-averaged and automated samples for measurement by any of several analytical techniques can be attained by dialysis into a solvent.

78-2735. Junk, G. A.; Richard, J. J.; Fritz, J. S.; Svec, H. J. (Ames Lab., ERDA, Iowa State Univ., Ames, IA) **Resin sorption methods for monitoring selected contaminants in water.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 135-153; 1977. (23 references)

Progress has been made during the past five years in identifying organic chemicals in drinking water. The identification methods which made this progress possible include charcoal adsorption, solvent extraction, freeze drying, steam distillation, and more recently, reverse osmosis, inert gas stripping, and resin sorption. A simple and accurate method for measuring small amounts of slightly volatile and lipophilic contaminants is discussed. This method uses the XAD-2 resin which had a high sorption capacity. A general resin sorption scheme is shown which is used for measuring organic compounds in water. The use of this technique for the detection of pesticides in surface waters, ground waters, and drinking waters is described. The purpose of analyzing ground waters was to determine whether selected pesticides had percolated to the ground water supplies after having been used for surface applications. Similarly the analysis of drinking water allows one to determine whether pesticides applied to agricultural land end up in drinking water supplies, either unchanged or as some stable degradation product. When contaminated river waters are the raw water sources for a drinking system supply, the contamination will also be present in the drinking water. Highest amounts are found in the spring and pesticides are always present in detectable amounts. If certain wells are the source and these lie within the alluvial plain of a contaminated river, the pesticides again will be present in the drinking waters. It is only when the raw waters are from wells outside the alluvial plain of a stream that the drinking water will be free from contamination.

78-2736. Budde, W. L.; Eichelberger, J. W. (Environ. Monit. & Support Lab., US EPA, Cincinnati, OH) **Development of methods for organic analyses for routine application in environmental monitoring laboratories.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 155-176; 1977. (8 references)

In order to establish a routine monitoring program which is sufficient to meet the needs for detection of organic pollutants, methods must be comprised of well-defined and well-documented analytical procedures. An overall plan for the application of these procedures must be devised, and the large-scale utilization of automation, including networks of lab minicomputers and large data base search systems, is required. Also, a rapid application of a fully-integrated quality control program must be made. The decrease in the cost of computer time and related hardware is aiding in allowing such monitoring networks to be established.

78-2737. McGuire, J. M.; Carter, M. H.; Alford, A. L. (US EPA, Southeast Environ. Res. Lab., Athens, GA) **Development of computerized GC/MS techniques within the US EPA.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 177-183; 1977. (13 references)

Methods must be found to detect trace quantities of specific organic chemicals in drinking water supplies. A rather nonspecific method of low sensitivity is of little value. Specific identifications are needed for various reasons, not the least of which is to allow tracing of the contaminant to its source, and subsequently, to allow adequate control methods to be enforced. It is also necessary to be able to specifically identify various compounds if one is to trace the path of degradation of compounds through the environment. Computerized GC/MS systems have been developed which provide powerful means of determining the identity of many organic pollutants. These methods, however, apply only to those compounds that can be gas chromatographed without decomposition occurring. Materials which might decompose require a more gentle separation method such as liquid or thin-layer chromatography. Combinations of computerized

liquid chromatography/ mass spectrometry and gas chromatography/ mass spectrometry will be extremely useful in detecting organic contaminants in the environment.

78-2738. Fine, D. H.; Rounbehler, D. P. (Therma Electron Res. Cent., Waltham, MA) ***N*-Nitroso compounds in water.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H. ed. (Ann Arbor: Ann Arbor Science): pp. 255-263; 1977. (13 references)

Many agricultural pesticides are secondary or tertiary amines and it is known that *N*-nitroso compounds are a major class of carcinogens likely to be causally related to human cancer. *N*-Nitroso compounds may be formed in water from amines and nitrite. Nitrates occur in water from runoff of sewage, agricultural land, and feedlots, and from these nitrates, nitrites are readily formed. Water from Buffalo was analyzed for possible presence of dimethyl nitrosamine (DMN) and other *N*-nitroso compounds. Identification of the compounds was made both by coincidence of retention time andd by comparison of the quantitative amount present in both gas chromatography and high-performance liquid chromatography. The highest level of DMN found in the South Baltimore area was 3 μg/l in the final effluent water from a sewage treatment facility, suggesting that the sewage effluent and/or runoff may be the prime sources. However, DMN is also present at a nearby chemical plant and a prime source may be leakage of the chemical to the air with subsequent deposit in the ocean.

78-2739. Veith, G. D.; Austin, N. M. (US EPA, Environ. Res. Lab., Duluth, MN) **Detection and isolation of bioaccumuable chemicals in complex effluents.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 297-302; 1977. (3 references)

During the years 1960-1970 it became obvious that chlorinated pesticides were so persistent in the environment and were so easily bioaccumulated that even an amount below the levels of detection could pose a threat to the entire ecosystem in time. A separation technique was developed using reverse-phase high-pressure liquid chromatography to isolate chemicals having potentially high lipid-water partition coefficients. Retention volume data for selected chemicals using this method for analysis is presented. The results indicate that there is a 250-fold range in retention volume despite the solvent program. Data are given for hydroquionine, *m*-aminophenol, resorcinol, catechol, phenol, *o*-aminophenol, 4-methoxyphenol, aniline, benzyl alcohol, *o*-toluidine, 4-nitrophenol, *o*-anisidine, benzaldehyde, 3-methylphenol, 2-phenylethanol, 4-methylphenol, indole, *o*-chloroaniline, benzene, *n*-methylaniline, acetophenone, cinnamyl alcohol, 4-chlorophenol, anisole, 2,4-dimethylphenol, dimethyl phthalate, 1-naphthol, 3-methyl- 4-chlorophenol, 2,4-dichlorophenol, pentachlorophenol (PCP), 4-phenylphenol, diethyl phthalate, naphthalene, 2,4,5-trichlorophenol, diphenylamine, diphenyl ether, anthracene, dibutyl phthalate, *p,p'*-methoxychlor, endrin, *p,p'*-DDT, *p,p'*-DDD (TDE), chlordane, hexachlorobenzene, Aroclor 1016, Aroclor 1242, Aroclor 1248, and Aroclor 1254.

78-2740. Keith, L. H. ; Garrison, A. W.; Allen, F. R.; Carter, M. H.; Floyd, T. L.; Pope, J. D.; Thruston, A. D., Jr. (Southeast Environ. Res. Lab., US EPA, Athens, GA) **Identification of organic compounds in drinking water from thirteen U.S. cites.** In: *Identification and Analysis of Organic Pollutants in Water.* Keith, L. H., ed. (Ann Arbor: Ann Arbor Science): pp. 329-373; 1977. (1977 references)

Organic compounds were investigated and identified in drinking water supplies from thirteen US cities. Three of these cities were located on the Mississippi River near New Orleans. The other cities included Seattle, WA; New York, NY; Miami, FL; Tucson, AZ; Ottumwa, IA; Grand Forks, ND; Cincinnati, OH; Lawrence, MA; Philadelphia, PA; and Terrebonne Parish, LA. over 80 contaminants were identified. Alachlor, an acetanilide derivative used as a pre-emergence herbicide for use with soybeans, corn, cotton, and peanuts, does not give an easily discernible molecular ion by electron impact mass spectrometry, and its spectrum was not in the computer data bank, thus making identification difficult. However, the gas chromatography peak indicated it was already present to a high degree in some of the samples. Identity was confirmed through chemical ionization mass spectrometry with further confirmation by Fourier transform gas chromatography-infrared spectroscopy. The use of various methods to detect and quantify concentrations of other organics found in drinking water is discussed.

78-2741. Ramakrishna, N.; Ramachandran, B. V. (Indian Drug Res. Lab., Poona 411005, India) **Preparation and assay of isomalathion.** *Indian. J. Biochem. Biophys.* 15(1): 80-81; 1978. (10 references)

A method for assaying commercial samples of malathion for their isomalathion content, and for monitoring the preparation of isomalathion, which is not commercially available, is presented. The method presented is a simple colorimetric method described for the quantitative determination of malathion and isomalathion in a mixture based on the easy leachability of the latter into alkaline hydroxylamine from a cyclohexane medium. Use of this procedure for monitoring the rate of conversion of malathion to isomalathion by heat treatment is described.

78-2742. Bidleman, T. F.; Matthews, J. R.; Olney, C. E.; Rice, C. P. (Dep. Chem., Univ. South Carolina, Columbia, SC 29208) **Separation of polychlorinated biphenyls, chlordane, and *p,p'*-DDT from toxaphene by silicic acid column chromatography.** *J. Assoc. Off. Anal. Chem.* 61(4): 820-828; 1978. (15 references)

Small columns of precisely deactivated silicic acid (3 g, 3.3% water) were investigated for separating hexachlorobenzene (HCB), polychlorinated biphenyls (PCB), DDE, DDT, and *cis*- and *trans*-chlordane from toxaphene. The chlorinated hydrocarbons were eluted from the column in 3

fractions: Fraction 1 (50 ml petroleum ether) contained HCB, PCB, DDE, and 10-30% *o,p'*-DDT. If desired, HCB could be separated from PCB by further dividing fraction 1 into 2 portions, the first 13 ml containing HCB and the next 37 ml containing PCB and DDE. Fraction 2 (80 ml petroleum ether) contained the chlordanes, *p,p'*-DDT, and 70-90% *o,p'*-DDT. Dieldrin and *p,p'*-DDD were eluted in a third (15 ml dichloromethane) fraction. The percentages of toxaphene eluted in the 3 fractions were approximately 10, 30, and 60%, respectively. Most of the toxaphene components interfering with the analysis of *p,p'*-DDT were eluted in the third fraction. This procedure has been very helpful in separating and identifying many of the high molecular weight chlorinated hydrocarbons in ambient air. (Author abstract by permission)

78-2743. Sans, W. W. (Agric. Canada Res. Inst., London, Ont. N6A 5B7, Canada) **Gas-liquid chromatography of aqueous-alcohol solutions for insecticide residue analysis.** *J. Assoc. Off. Anal. Chem.* 61(4): 737-840; 1978. (3 references)

Injection of water-methanol solutions of insecticides into a gas-liquid chromatograph, equipped with alkali flame ionization and electron capture detectors, is a simplified, cost-saving technique for obtaining analytical data since the most economical solvents are used and time spent on extraction is eliminated. The procedure has been used to obtain water-solubility values for 20 insecticides ranging from 0.09 ppm (iodofenfos) to 4000 ppm (disulfoton sulfoxide) and for determining equilibrium concentrations of insecticides in clay-water suspensions. The usefulness of this technique is limited by the sensitivity of the gas chromatographic system which may require concentration of the extracts, and the stability of the compound in an aqueous system. (Author abstract by permission)

78-2744. Lee, Y. W.; Westcott, N. D.; Reichle, R. A. (Res. Stn., Branch 107, Agric. Canada, Saskatoon, Sask. S7N OX2, Canada) **Gas-liquid chromatographic determination of pydrin, a synthetic pyrethroid, in cabbage and lettuce.** *J. Assoc. Off. Anal. Chem.* 61(4): 869-871; 1978. (4 references)

Pydrin, (fenvalarate) α-cyano-3- phenoxybenzyl 2-(4-chlorophenyl)- 3-methylbutyrate, a synthetic pyrethroid ester, is extracted from vegetables with acetonitrile, partitioned into petrolum ether before cleanup on a Florisil column, and analyzed by electron capture gas-liquid chromatography. Recoveries of 88-102% at 0.01 ppm, 99-102% at 0.1 ppm, and 98-104% at 1.0 ppm were obtained from fortified cabbage and lettuce samples. The method appears applicable to detection of the residues of Pydrin in the foliage of many types of crops. (Author abstract by permission)

78-2745. Lawrence, J. F.; Leduc, R. (Food Res. Div., Health Protect. Branch, Health & Welfare Canada, Ottawa, Ont. K1A 0L2, Canada) **High pressure liquid chromatography with ultraviolet absorbance or fluorescence detection of carbaryl in potato and corn.** *J. Assoc. Off. Anal. Chem.* 61(4): 872-876; 1978. (13 references)

Carbaryl (1-naphthyl-*N*- methylcarbamate) was extracted from corn and potato with acetone. The acetone extract was partitioned into methylene chloride-hexane and concentrated for cleanup on a 5% water-deactived Florisil column. The fraction containing the carbamate was subjected to high pressure liquid chromatographic (HPLC) analysis on a 25 cm LiChrosorb Si60 (5 μm) column (2.2 mm id) by various means. First, the pesticide was analyzed directly with ultraviolet (UV) absorption detection at 254 nm and a mobile phase of trimethylpentane-isopropanol (96+4). After this, a fluorescent derivative was prepared, using dansyl chloride (5-dimethyl amino naphthalene- 1-sulfonyl chloride), and analyzed by HPLC, using trimethylpentane-dioxane (95+5) as the mobile phase, with both UV absorption (254 nm) and fluorescene (excitation 365 nm, emission > 400 nm) detection. The response/ng for the dansyl derivative with fluorescence detection was 1.3 times greater than that for UV detection and 8 times more sensitive than direct UV detection of the carbamate. About 10 ppb carbaryl could be detected after derivatization in the foods studied; for direct analysis, 30-50 ppb could be detected at a 2:1 signal: noise ratio. Recoveries at 0.1 ppm averaged 90% by direct analysis compared with 78% after derivatization. (Author abstract by permission)

78-2746. Carver, R. A.; Borsetti, A. P.; Kamps, L. R. (Div. Chem. & Phys., FDA, Washington, DC 20204) **Gas-liquid chromatographic determination of Kepone residues in finfish, shellfish, and crustaceans** *J. Assoc. Off. Anal. Chem.* 61(4): 877-883; 1978. (12 references)

Finfish, shellfish, and crustacean samples are extracted with isopropanol and benzene; the extract is filtered and then concentrated. The extract, dissolved in hexane, is treated with oleum and extracted with aqueous alkali. The aqueous phase is acidified and extracted with petroleum ether-ethyl ether (1+1). The Kepone (chlordecone) residue is determined by electron capture gas-liquid chromatography (GLC). Recoveries obtained by 8 laboratories from 15 species of finfish fortified at 0.02-0.23 ppm ranged from 37 to 107% with a mean ± relative standard deviation of 79.4 ± 14.5%. For oysters fortified at 0.01-0.10 ppm, recoveries range from 63 to 129% with a mean of 78.2±20.8%. For crustaceans fortified at 0.05-0.26 ppm, recoveries ranged from 52 to 110% with a means of 78.8 ± 16.4%. The approximate limits of quantitation for finfish and for shellfish and crustaceans are 0.02 and 0.05 ppm, respectively, under the GLC conditions used in this study. (Author abstract by permission)

78-2747. Baker, H. J. (Biol. & Chem. Res. Inst., New South Wales Dep. Agric., Rydalmere, NSW 2116, Australia) **Rapid spectrophotometric method for determination of 2-aminobutane in postharvest dips.** *J. Assoc. Off. Anal. Chem.* 61(4): 1001-1003; 1978. (6 references)

A rapid method is described for measuring 2-aminobutane is postharvest dip fluids. Samples of the dip fluid are diluted to bring the 2-aminobutane content in the range 500-5000 μg and reacted with carbon disulfide and cuprix ion to form a chlorform-extractable complex mea-

sured spectrophotometrically at 430 nm. The accuracy and reproducibility of the method are comparable with the more lengthy modified product and residue methods. (Author abstract by permission)

78-2748. Dudkin, M. S.; Skornyakova, N. S.; Denisyuk, N. A.; Lemle, N. A. (Odessa Inst. Food Technol., Odessa, USSR) **Opredelenie soderzhaniya karbamida v kombikormakh. [Determination of carbamate compounds in mixed animals feeds.]** *Khim. Sel'sk. Khoz.* (5): 56-58; 1978. (7 references) (Russian)

A new method for the determination of carbamate in mixed animal feed is described. Carbamate is extracted from the sample by means of water then decomposed by urease obtained from soybeans. The ammonia formed is determined by potentiometric back titration. The method is sufficiently selective due to the use of urease. The analytical results are reliable even at a carbamate content of 1 mg. At carbamate contents of 1-5% the relative error of the determination was found to be 1.9%.

78-2749. Novozhilov, K. V.; Petrova, T. M.; Kopytova, F. I. (All-Union Res. Inst. Plant Prot., Leningrad, USSR) **Opredelenie saifosa i oksisaifosa v rasteniyakh. [Determinatin of menazon and oxymenazon in plants.]** *Khim. Sel'sk. Khoz.* (5): 60-62; 1978. (16 references) (Russian)

Thin-layer chromatographic method for the determination of sayphos (menazon) and oxymenazon in the green parts of pea, tomato and potato plants, in peas and potatoes as well as in soil is described. Chloroform is used for extraction of menazon or its oxy-derivative from plant materials, and acetone or acidified chloroform is used for their extraction from soil. Following re-extraction with chloroform, the sample is applied on Silufol UV-254 or silica gel KSK layer, using acetone: hexane (2:1) as solvent system, and 2,6-dibromo-*N*- chloroquinone imine in hexane or 4-(*n*- nitrobenzyl) pyridine in acetone for visualization in UV light. Quantitative determination is done by visual comparison of the color intensity of the spots against those of a standard solution. The sensitivity of the method amounts to 0.04 mg/kg for menazon, and to 0.08 mg/kg for oxymenazon. The recovery rate is 70-95%.

78-2750. Bulcke, R. A. J.; Stryckers, J. M. T. (Lab. Herbol., Fac. Agric. Sci., State Univ. Gent, Gent, Belgium) **Bioassays for the detection of herbicides and algicides in water.** *Meded. Fac. Landbouwwet. Rijksuniv. Gent.* 42(2): 1625-1634; 1977. (18 references)

Three bioassays for the detection of herbicides and algicides in water are described. A flamentous alga, *Oedogonium* sp., was found to be extremely sensitive to photosynthesis inhibitors such as diuron, cyanatryn, and terbutryn. ED_{50} values for the dry matter production of this alga were as low as 2 ppb (cyanatryn), 5 ppb (terbutryn), and 13 ppb (diuron). Preliminary studies indicated that this alga might be used for the qualitative detection of herbicides such as propham, propyzamide, and trifluralin, which inhibit cell division. In another bioassay in which the dry matter of the aerial parts of garden cress, *Lepidium sativum*, L., was taken as the indicator of biological activity, ED_{50} values of 0.04 and 0.09 ppm were observed for cyanatryn and terbutryn, respectively. A simplified garden cress root growth test allowed the determination of low concentrations of the benzonitriles, dichlorbenil and chlorthiamid. ED_{50} values for the root length of garden cress were in the range of 0.05-0.06 ppm for both herbicides.

See also 78-2503, 78-2509, 78-2537, 78-2538, 78-2539, 78-2540, *and* 78-2547.

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